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MARTA TUNNEL CONSTRUCTION IN DECATUR GEORGIA--
A Case Study of Impacts

Peter C. Wolff and Peter H. Scholnick

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55 Wheeler Street
Cambridge MA 02138

JULY 1977
FINAL REPORT

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Office of Technology Development and Deployment
Office of Rail Technology
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16. Abstract

A case study was conducted in Decatur, Georgia in order to assess the disruptive effects associated with the construction of rapid transit tunnels for the MARTA East Line. The case study has three major objectives: (1) to pilot test our assessment methodology developed in an earlier phase of the study; (2) to refine the methodology as a forecasting tool based on the case study findings; (3) to develop mitigation procedures.

A socio-economic profile of Decatur was first presented. Then impacts of the construction were considered, first in general terms, and then very specifically by following the route of construction through Decatur for two miles from west to east. Major findings were that there were three causal agents which were more important than others: the barrier effect, noise, and mud. There were also three groups which were more severely affected than others: the retail merchants in downtown Decatur, middle class residents along a residential portion of the alignment; and the "special population" (poor, black, and elderly) in a public housing project.

"Retrospective forecasting of impacts" was then addressed to answer the question: what was learned from the assessment of impacts that would have enabled these impacts to have been predicted at the planning stage? The finding was that many impacts could have been predicted through use of a "predictive logic", and that, therefore, mitigation measures could have been taken.

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PREFACE

This study is a continuation of an earlier one entitled Assessment of Disruptive Effects Associated with Urban Transportation Tunnel Construction.

The earlier part of the study (which we shall refer to as Phase I) was primarily theoretical in nature. It began with a literature review and some background considerations; it then developed a matrix of construction impacts that was useful for identifying a variety of impacts and a variety of groups affected by the construction. The study then went on to distinguish between social, economic, and environmental impacts and gave detailed examples of certain kinds of economic and social impacts. This was followed by chapters that dealt with problems of measuring impacts and problems of aggregating impacts. There were also a brief chapter on possible ways of mitigating impacts, two "mini-case studies," and suggestions for future research. A report on Phase I of the study was published in June 1976 (Report No. UMTA-MA-06-0025-76-5) (NTIS No. PB 256-848).

The present part of the study (which we shall refer to as Phase II) is a case study of an on-going tunnel construction project of the Metropolitan Atlanta Rapid Transit Authority in Decatur, Georgia. The relation of the case study to the earlier work is explained in the Introduction to the report.

Data collection for the case study was done by Peter Scholnick and Marian Henneman, both of whom also contributed to the preparation of this report. Photographs in the report, unless otherwise credited, were taken by Peter Scholnick. William J. Salter made valuable methodological suggestions, particularly in the area of impact prediction. Once again, Stephen J. Fitzsimmons was helpful in the design and writing of the final report. The report was written by Peter Wolff.

We wish to thank all of the above and also Robert Burlin of Parsons, Brinckerhoff, Quade & Douglas. This firm was a sub-contractor for this study, as they had been for the earlier one.

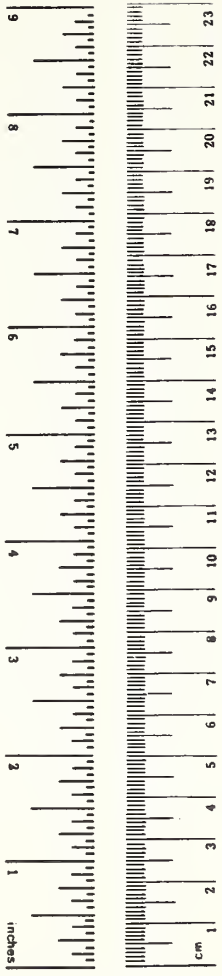
Special thanks must go to all the persons whom we interviewed in Decatur in the course of our site visits. We were given unstinting help by almost everyone with whom we talked. Particularly outstanding was the cooperation received from personnel from MARTA, from the City of Decatur, and from the resident engineers' offices. We appreciate all of their help.

Thanks must also go to Mr. Gilbert Butler of the Office of Rail Technology of UMTA for his continuing support, and particularly to Gerald Saulnier in the Office of Ground Systems of the Transportation Systems Center, Cambridge, Massachusetts, who was the Technical Monitor for this phase of the study and made himself constantly and helpfully available. This study was performed under contract to the Transportation Systems Center.

METRIC CONVERSION FACTORS

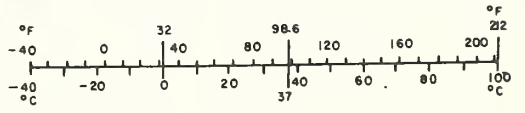
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acras	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teespoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	qwarts	0.95	litars	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius tamperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	squere centimeters	0.16	squere inches	in^2
m^2	squere meters	1.2	square yards	yd^2
km^2	squere kilometers	0.4	square miles	mi^2
ha	hectaras (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilogrems	2.2	pounds	lb
t	tonnas (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic metars	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius tempereture	9/5 (then add 32)	Fahrenheit temperature	°F



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1. INTRODUCTION AND OUTLINE OF REPORT

1.1 OVERVIEW OF THE OBJECTIVES OF THE STUDY

This report is part of a study entitled Assessment of Disruptive Effects Associated with Urban Transportation Tunnel Construction. The objectives of this study are (1) to identify impacts of tunnel construction, (2) to measure the impacts, and (3) to develop a preliminary approach to predicting and assessing impacts resulting from tunnel construction. The study had two phases.

Phase I was primarily a theoretical study. A report on this phase (No. UMTA-MA-06-0025-76-5) was published in June 1976. It ended with some suggestions for future research.

Phase II of the study, on which the present volume reports, grew directly out of one of the tasks suggested for future research, namely, the collection of data on actual impacts in an actual construction setting. Since Phase I had been so largely theoretical, the study team felt a need to study an on-going tunnel construction project, in order to compare the theoretical work of Phase I with what would be found in the real world.

Accordingly, a case study of tunnel construction in Decatur, Georgia, where a rapid transit line of the Metropolitan Atlanta Rapid Transit Authority (MARTA) is being constructed, was decided on. In the following section of this report we shall discuss the rationale for conducting a case study; we also discuss in the same place why and how Decatur, Georgia was chosen as the focus of this study.

1.2 THE MARTA/DECATUR CASE STUDY

The work on which we report was performed during the second half of 1976. Three site visits were made to Decatur in the span of four months (July to October, 1976) to collect primary data. When we made the first site visit, the work in Decatur had barely begun, with

much of the right of-way still untouched by construction activity. By the time of the last site visit, construction was underway everywhere in Decatur. We also made some telephone calls during December of 1976 and January of 1977, so that we were able to include some last minute data.

In January 1977, when we checked on the progress of the tunnel construction, we found that some of the construction was within weeks of being finished and that the peak of construction activity had been reached. Our study, therefore, covered the period of highest construction impacts.

In addition to primary data, we collected secondary data from a number of sources, chiefly MARTA, the City of Decatur, and the Atlanta Regional Commission. We also had the cooperation of the General Engineering Consultants to MARTA, a joint venture of Parsons, Brinckerhoff, Quade and Douglas and Tudor Engineering Company. Through them, we were able to talk with the resident engineers on the tunnel segments we studied and to obtain data from them, such as the kinds of complaints that were received from affected persons.

1.3 ORGANIZATION OF THE REPORT

This introductory section is followed by a section that deals with the methodology of the case study (Section 2). In Section 3, we give an overview of the City of Decatur. We describe it geographically and demographically and give its general socio-economic characteristics. We also briefly describe the alignment of the rapid transit line through Decatur.

In Section 4, we detail the actual impacts which we identified. Impacts are first considered in a general way in Section 4.1. Then, in Section 4.2, we enumerate all the impacts which we found along the construction, proceeding from west to east along the alignment.

In Section 5, we take up an important question: could the impacts which we identified in Decatur have been predicted before they

actually occurred, namely, at the planning stage? And if the answer to that question is affirmative, how could such a prediction have been made?

Section 6 deals with possible ways of mitigating impacts, in the light of what we learned in Decatur. Appendix A takes another look at directions for future research, in the area of disruptive effects associated with urban transportation tunnel construction.

2. METHODOLOGY OF THE CASE STUDY

Before beginning with the details of the MARTA/Decatur case study, it is necessary to consider some methodological points. Among them are

a. the reasons for conducting case studies;

b. reasons for conducting a case study in Phase II;

c. the reason for choosing Decatur, Georgia as the location for this case study;

d. the major objectives of the MARTA/Decatur case study;

e. pruning the matrix presented in Phase I;

f. specification of data needed for the MARTA/Decatur case study.

2.1 CASE STUDIES IN GENERAL

The case study is one of a number of traditional forms of research in social science. It is a form of qualitative research: a case study attempts to get at the particular qualities and attributes of a given situation (i.e., a case study deals with one case). Case studies may, of course, include considerable amounts of detailed quantitative data. They do not, however, in general, have the statistical and comparative nature of surveys (which deal with many cases) and which, therefore, are generally considered to be quantitative research. There are a number of purposes for which case studies can be used; in general, a given example of case study research will address several of these purposes to varying degrees:

a. to document and describe a unique situation (this is the physicians' use of the term);

b. to analyze a complex problem (as commonly used in management science and organizational studies);

c. to generate hypotheses for subsequent quantitative research (as is frequently done in many large-scale policy studies and in surveys where the specific variables and design are not specified a priori);

d. to develop generalizations (rather than "prove them") about situations which share some essential features but differ on others (this is the general use of the "comparative case study," frequently employed in social science);

e. to refine and test an approach or technique, observing the context and concomitants of the application in more detail than in the desired ongoing use. (This, of course, is the pilot-test use of the case study. Most pilot tests, even of survey instruments or research designs, depend on the case study approach in that the testing function requires attention to a variety of qualities that affect the applicability of the thing being tested. These attributes are generally extrinsic to the thing itself and, thus, at least an implicit case study approach is being used.); and

f. to plan. Most sophisticated planning activities, particularly at the project level, are essentially case studies used for "predictive" purposes. Although the particular prediction techniques can vary widely, the specificity of the planning to a particular project environment requires that a general case study approach be used.

There are essentially two types of case studies: descriptive and comparative. The choice of which general type of case study to use, as well as the detailed specification of the methods of conducting the research, are naturally dependent on the particular goals of the study. The MARTA/Decatur case study is descriptive in character; its goals fall into categories e. and f. of the list above: to test the methodology already developed in Phase I of the study, and to help plan mitigation procedures that might be developed in situations similar to the one in Decatur.

2.2 REASONS FOR CONDUCTING A CASE STUDY IN PHASE II

In Phase I we developed a methodology that was intended to help forecast the impacts of urban tunnel construction. It was based on literature review, field research, and extensive thought and discussion. The choice of the case study approach to Phase II was made for several reasons, reasons which relate to the uses of case studies discussed above.

First, it was necessary to test and refine the method developed in Phase I for assessment of impacts. Application to an on-going, real world urban subway tunneling project seemed the best way to achieve this field test objective. Second, we wished to explore the extent to which our methodology could fruitfully be applied in a planning context, in a unique situation -- which is what a case study describes -- in order to forecast impacts. Finally, we wanted to develop more specific suggestions for strategies that might be employed in order to mitigate impacts, and this development could best be furthered by research in an actual urban tunnel construction environment.

2.3 REASONS FOR STUDYING DECATUR, GEORGIA

In choosing a site for the case study, the study team was constrained by the fact that tunnel construction for mass transportation in urban areas is going on in only a few locations in the United States. Washington, D.C. (WMATA) and Atlanta, Georgia (MARTA) are the two major locations where actual construction is now under way. The Bay Area Rapid Transit System (BART) has been finished, Baltimore's subway is just beginning to get started, Boston (MBTA) is planning various extensions but no actual construction is going on at the moment, New York's Second Avenue line is stalled and Chicago is still in the planning stage as far as putting the Loop underground is concerned.

Of the two rapid transit systems under construction, Atlanta appeared to offer the better opportunity for studying disruptions. In Phase I of the study, we had already done a partial study of the disruptions associated with the construction of the Waterfront Station in Washington, D.C. Furthermore, construction in the Washington Metropolitan Area has been going on for a long time now, so that most of the construction projects were either under way or have been in the planning stage for some time. Furthermore, Washington, D.C. is not quite typical of future rapid transit systems: its system was initially planned and

funded without input from UMTA, with monies being provided directly by the Congress. Only in the last year or so has WMATA funding come through UMTA, with consequent need to adhere to UMTA guidelines.

The Metropolitan Atlanta Rapid Transit Authority offered the best available opportunity for studying on-going construction and, furthermore, for studying several different phases of construction. With this in mind, we investigated the MARTA system to see where we might best direct our efforts.

After electing to study the MARTA system, we were next faced with the question of which segment or segments of the system would be most appropriate for our research effort. In selecting a site, we were guided by several criteria.

First, the site had to have construction actually going on. At the same time, the construction had to be in its early stages, so that we might be able to observe the progression of construction events and the resulting impacts. Furthermore, it was desirable to find a site where we could observe simultaneously several of the (early) stages of construction.

Second, it was important to find a site in which major portions of the rapid transit alignment were subsurface. Much of the MARTA system is being planned at grade or in open trench; we wanted to be able to study impacts associated with tunneling and with different types of tunneling (cut-and-cover, open trench, soft ground boring, etc.). It was also desirable to find line segments in which a variety of construction techniques was employed, so that we could study the impacts resulting from these different techniques.

Third, it was desirable that the site display mixtures of socio-economic characteristics and land use. The ideal site would be as diverse as possible, in a small area. This would enable us to fill in as many of the cells of the Phase I matrix as possible. Thus, we were hoping to find a site in which the rapid transit alignment would

traverse areas of residential, commercial, and institutional use. We also were hopeful that the neighborhoods would reflect diversity of income, housing (single family, townhouse, and high rise apartment), and of race.

Fourth, in order to facilitate data collection we looked for a compact area. Such an area would also be more typical of urban areas in general than a thinly populated, spread out area. We also tried to find an area which was reasonably stable so that it would be relatively easy to attribute impacts to specific causal agents.

With these criteria in mind, we began our selection process of a site for the case study in the Atlanta area. Three possible sites were considered: the so-called Peachtree Street corridor, the Five Points Station, and the segment of the so-called East Line from East Lake Station through the heart of the city of Decatur to Avondale Station.

The Peachtree Street Corridor, though in many ways a very interesting site, could be eliminated at once. While much controversy has been generated by this segment of the line, particularly concerning the method of construction to be used here, and while this segment goes through the very heart of downtown Atlanta (which would make this very attractive for a case study that wanted to learn about the impacts on a central business district), no actual construction on this segment has begun. There is, at the present time, nothing to study except the process by which the decision was made to change the method of construction from cut-and-cover to hard rock boring. This is intrinsically a very interesting subject for study; it is not, however, directly germane to the subject of Phase II.

Construction has started on the second site we considered, the Five Points Station. This station is going to be the hub of the entire system; the north-south line and the east-west line will meet here. Some disruption can already be noticed; for example, a bridge carrying

Forsyth Street was closed during much of the summer of 1976 because of construction. The construction, however, is not subway construction. The station will basically be located at grade along an existing railroad right of way. Several of the downtown streets cross the railroad on bridges (as Forsyth Street does) and thus will also cross the MARTA line and the station on bridges. The disruptions, both those now occurring and those anticipated in the future, will not basically be due to tunnel construction, therefore, but simply to the fact that a large-scale construction project is being carried on in downtown Atlanta.

That left the third site, the portion of the East Line through Decatur. Fortunately, this section of the rapid transit line possessed most of the characteristics we were looking for. Construction was under way; both cut-and-cover and open trench construction methods were being used. Several different stages of construction could be observed; some portions of the line had not yet begun to be excavated, at others, digging was just beginning, and at yet others, the subway box had already been completed and backfilling was in progress.

The line segment, which is about two miles long, traverses neighborhoods with both black and white populations. Beginning at its western end, it goes through low income areas, through and near public housing developments, through a retail business block, then through a block that features institutional uses, and then through several middle-to-high income residential blocks. The general impact area also includes a public school, a park, a public swimming pool, major government offices of the city of Decatur and DeKalb County, and two large office buildings.

If the site had a major deficiency, it was that none of the construction involved boring of any kind. Another difficulty arose from the fact that the city of Decatur has been going through a period of change. Some of the impacts that residents are feeling are a

mixture of impacts from the subway construction and of impacts arising from other causes (particularly demolition of houses in areas slated for urban renewal). These aspects of Decatur, however, did not seem to lessen the value of studying it. The fact that no boring techniques were being used made it more rather than less likely that we would be able to identify construction-associated impacts. Since Decatur is a city in change, that made it all the more typical of inner cities throughout the United States and so a fit subject for a study of urban tunnel construction.

2.4 CASE STUDY OBJECTIVES

Three major objectives were defined for the MARTA/Decatur case study:

a. pilot test the assessment methodology developed in Phase I of the study;

b. refine the methodology as a forecasting tool based on case study findings;

c. develop suggested mitigation procedures.

Other objectives, instrumental in achieving the major objectives were the following:

d. identify types and sources of data appropriate for impact forecasting;

e. identify alternative approaches to data collection;

f. identify alternative measures for various indicators of impact;

g. develop some hypotheses regarding the mechanisms, processes and types of impacts associated with tunnel construction;

h. describe impacts experienced in Decatur.

In the next sections, we shall examine the major objectives in some detail.

2.4.1 Pilot Test of the Methodology

The pilot test nature of the case study implied that as a result of the work, we would modify and refine our methodological techniques as we actually implemented them. It was the pilot test nature of the case study, in fact, which made the application of an assessment methodology useful in developing a methodology which could eventually be used in forecasting impacts (see Section 2.4.2).

In Phase I of the study, a preliminary assessment methodology was developed. A major part of this methodology was the development of a matrix which displayed the loci of tunnel construction impacts by arraying causal agents and affected groups. This matrix is reproduced in Figure 1. It must be noted that the matrix was designed as a generic tool, encompassing the entire range of possible construction impacts. It was not to be expected that any one project would involve all of the cells of the matrix. However, because of the comprehensiveness of the design, data might well be potentially available to fill some irrelevant cells, and thus it was necessary to "prune" the matrix as early as possible in applying the methodology, to use resources most efficiently.

In general, it is possible to eliminate whole rows or columns, rather than only isolated cells. The first step in the methodology, and thus the first step in the actual field test case study, was this "pruning" of rows and columns from the matrix (see Section 2.5). This first step was then followed by application of the matrix, in that data were gathered to describe the impacts on affected groups by causal agents.

Following the data-gathering (using the matrix), the analysis began. At this stage, we were faced with the issue of attribution -- were given impacts due to the tunnel construction, or would they have occurred anyway?

AFFECTED GROUPS \ CAUSAL AGENTS			Traffic interference		Takings of				Environmental Disturbances							Utility disruptions	
			Vehicular	Pedestrian	Businesses	Residences	Public Properties	Community Institutions	Noise Pollution	Air Pollution	Water Pollution	Heat	Vibration	Solid Waste Disposal	Visual Impact	Planned	Unplanned
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BUSINESS	manufacturing	A															
	retail	B															
	wholesale	C															
	service	D															
EMPLOYEES		E															
PATRONS		F															
RESIDENTS		G															
LOCAL GOVERNMENT SERVICE PROVIDERS		H															
OWNERS		I															
INSTITUTIONS		J															
SPECIAL POPULATIONS		K															

FIGURE 1. THE MATRIX DEVELOPED IN PHASE I OF THE STUDY (See Figure 2 of earlier report.)

Next, the applicability of the methodology for prediction of impacts had to be considered. This meant collecting base line data and facing (if not solving) the attribution problem. That is, we had to attribute impacts to construction and relate them in turn, to those baseline data which we had determined (or hypothesized) were available in the planning stage of a project and could be used in forecasting them.

Revising the methodology developed in Phase I of the study, based on the insights gained in conducting the pilot case study occurred at virtually every step mentioned above. The revisions tended toward greater explicitness in the steps of the process, greater specification of data sources and collection approaches, and greater amenability to use in impact forecasting rather than only impact assessment.

2.4.2 Assessment and Forecasting of Impacts

Let us begin with an examination of the distinctions and relationships between assessment and forecasting. Forecasting of impacts occurs before actual construction begins and is based on consideration of the particular aspects of the construction project itself, on the local conditions, and on accumulated knowledge of the typical processes through which tunnel construction impacts occur. Assessment of impacts, on the other hand, occurs after construction and focuses on the nature of actual impacts borne by particular groups in association with specific causal agents. To be maximally useful, forecasts of impacts must address the issues of both affected groups and causal agents, since these provide a basis for selection and development of optimal mitigation procedures.

The case study of on-going tunnel construction in Decatur, assessed actual impacts. It was helpful in developing a forecasting methodology because

a. only through assessment of actual impacts can it be discovered what the impacts are that will eventually have to be forecast in similar tunnel construction projects where local conditions are different;

b. it revealed not only what the impacts of construction were but also the manner in which the various causal agents operated to bring about these impacts;

c. measures of impacts were discovered on which forecasts will ultimately be based; and

d. to the extent that impacts were forecast (for example, in sections of Decatur that were not under construction during the early stages of the case study but where construction is now under way), the forecasting methodology was verified.

The ideal goal of the MARTA/Decatur case study, given the distinctions between assessment and forecasting of impacts, was to assess impacts and then to illustrate how those actual impacts could have been forecast.

Assessed impacts are functions of interactions among attributes of the community and of the project. The project attributes include not only construction techniques, but mitigation strategies already used, community and institutional relations of MARTA, and even the particular experience and approach taken by the contractors involved. To the greatest extent possible, the MARTA/Decatur case study attempted to disentangle these interactions and effects.

The basic questions posed by the consideration of the relationship between assessment and forecasting are thus: How could the impacts which were assessed have been predicted, based on the data available in the planning phase? And: What mitigation procedures, if implemented, would have offset these impacts? Although it is not possible, within the time and resource constraints of this case study, to address these questions with methodological rigor, the case study explicitly tries to make some approximations to answering them.

2.4.3 Mitigation of Impacts

A third purpose of the case study was to begin to develop some suggestions for procedures that might be implemented in order to mitigate construction impacts. These suggestions, though brief and general, will be of considerable importance, since the entire effort of the study is ultimately directed toward identifying such mitigation procedures.

Mitigation procedures suggested were derived directly from the answer to the question: How could the assessed impacts have been predicted at the planning stage, prior to construction? For if one can forecast what impacts are going to take place, then one can also take measures to lessen or offset them. Or, alternatively, one can decide that it is not worthwhile to try to mitigate the impacts, because they are too slight, or because it is too expensive to try to mitigate or avoid them.

2.5 PRUNING THE MATRIX

Having selected Decatur as the site for the case study, the study team next deliberated more specifically how the test of the methodology would be conducted. A first step was to "prune" the impact matrix in two stages. The first pruning was done by identifying -- tentatively, based on findings from the preliminary site visit -- which cells of the matrix were, or potentially were, relevant to the situation in Decatur. A second, further pruning involved deciding which among the cells deemed relevant should be "filled out," on the basis of probable magnitude of impact and level of effort required for the data collection and analysis, given the schedule and resources of the case study effort.

The results of the tentative "pruning" indicated the foci for testing the methodology in Decatur: those cells which, initially at least, were identified as warranting expansion in the case study were

all in Rows B (retail business), G (residents), and K (special populations, i.e., the elderly, the poor, and the black), as well as cells H1, H2, I1, I2, and J1, J2 (that is, impacts of vehicular and pedestrian traffic interference on local government service providers, on owners, and on institutions).

2.6 SPECIFICATION OF DATA NEEDS

After thus pruning the matrix to the exigencies of the case study site and project scope, the second step in preparing to field test the methodology was to determine the data collection needs for filling out the selected cells of the matrix. Data of two kinds were required: baseline data, that is, before-project and without-project data on conditions in the community; and impact data, or data describing the changes from baseline conditions attributable to transit tunnel constructions.

Baseline data again were of two general kinds: there were first those data which serve to describe the city of Decatur in overall socioeconomic terms, through such indicators as population (and trends in population change), income (and trends of income change), racial composition, housing mix (single and multi-family dwellings), and the like. Many of these data were obtained through the United States Census. Census data, however, at this time tend to be quite outdated. This is especially true of census data that are used as economic indicators (such as rates of unemployment, income, housing vacancy rates) because in the period since 1970 (when the last census was taken) the United States has gone through severe economic upsets such as the Arab oil embargo in 1973 and the consequent energy crisis with the attendant economic depression and unemployment that still existed at the end of 1976, which make the 1970 figures of economic indicators completely meaningless. Fortunately, we were able to get more recent figures (or at least sound estimates for more recent figures) through the work

of the Atlanta Regional Commission (ARC). The commission has prepared figures for 1975 on population, housing, labor force, employment and land use, and has prepared forecasts on these indicators for 1980, 1990, and 2000. The figures and forecasts are given by census districts and by "superdistricts" (which consist of several census districts). Decatur makes up Superdistrict 21 in ARC's scheme, so that we were able to get this kind of data for the city rather easily.

The second kind of baseline data are data on certain specific indicators which are, or are expected to be, changed by the impacts of the construction. These baseline data are those which were elaborated in Phase I of the study, in Chapters 5 and 6. In those chapters we indicated how economic impacts (on retail businesses) and social impacts (on residents) might be measured. The measurement variables which were there indicated are the baseline data that needed to be collected in Decatur in order to measure impacts.

By comparing the baseline data with data collected after the construction had begun, we hoped to be able to get a notion of the size of impacts attributable to the construction. It was too much to hope, of course, that in the short span of time available we would be able to collect complete data on sales, number of purchases, profits, etc. for all the affected stores in the Decatur area. But we did hope to collect some such data (and did succeed in doing so).

Impact data, then, also are of two kinds. The first kind are the data collected on the base line indicators (such as retail sales and profits) after the construction has begun. Insofar as these kind of data can be obtained they are "hard" and quantitative data. The second kind of impact data are those collected from affected groups, persons, and institutions by means of interviews. These data will often be anecdotal in character and will not have the same precision as the quantitative data. Nevertheless, these data are valid, too, and need to be collected. They give information on perceived impacts, which are of the greatest importance.

3. MARTA IN DECATUR, GEORGIA

3.1 THE CITY OF DECATUR

Decatur, Georgia is called an "intown suburb" of Atlanta in the Decatur Rapid Transit Impact Study. It is directly adjacent to Atlanta, with downtown Decatur about 6 miles east of downtown Atlanta. While Atlanta is located in Fulton County, Decatur is in DeKalb County and is, in fact, the county seat of DeKalb County. As one drives east from Atlanta along Ponce de Leon Avenue, the main route connecting Atlanta and Decatur, the two cities imperceptibly blend into one another.

Decatur's main economic activity at the present time stems from the county government. The heart of downtown Decatur is Court Square, in the middle of which stands the old DeKalb County Courthouse, a traditional building with a monument to the Confederate soldiers in front of it. (MARTA construction required that the monument be moved 15 feet closer to the courthouse than it had been.) Nowadays, most county business is transacted in a modern, highrise county court and office building one block south of the old courthouse.

The northside of the old courthouse faces on Ponce de Leon Avenue. The south side of Court Square is formed by a street that is called Swanton Way west of the old courthouse, and Sycamore Street to the east of it. The first block of Sycamore Street, running from Court Square to Church Street, contains the major concentration of retail businesses in the city. MARTA's Decatur station is being built under this first block. Because of the construction, all the stores on the north side of Sycamore Street (from Court Square to Church Street) were torn down, as were a couple of stores on East Court Square, directly at the corner of Sycamore Street. The remaining stores, on the south side of Sycamore Street, are among the most heavily impacted buildings in the entire city. Other major retail business concentrations can be found on Ponce de Leon Avenue, Clairmont Street, and Church Street.

When the subway construction is finished, the block of Sycamore from East Court Square to Church Street will be closed to vehicular traffic and converted into a pedestrian mall. (See Figures 2 and 3.)

Decatur is an aging city. It was incorporated in 1823 and thus is older than Atlanta which was not incorporated until 1845. It exhibits many of the phenomena of slowed growth, inner city decline and lowered real estate values that are familiar to students of the urban scene in America. Affluent families in the Atlanta area are for the most part moving to suburbs that are farther out than Decatur; large regional shopping centers have taken away much of the business that formerly came to Decatur.

Decatur's population is small and has been getting smaller; at the same time, the percentage of blacks and other minorities has been increasing:

TABLE 1. POPULATION FIGURES FOR DECATUR

Population	1960	1970	1975
Total population	22,026	21,943	19,862
White	18,895	13,256	11,985
Black and Other	3,131	8,687	7,877
Black and Other as percent of total	14	40	40

Source: 1975 Population and Housing, Prepared by the Atlanta Regional Commission. Table 8, p. 31.

While the percentage of the population that is black has been increasing, the parts of the city where blacks are concentrated have changed greatly. Decatur is divided into four census tracts, 225, 226, 227, and 228 (see Figure 4). Since 1960, the percentage of blacks in these tracts has changed as follows:

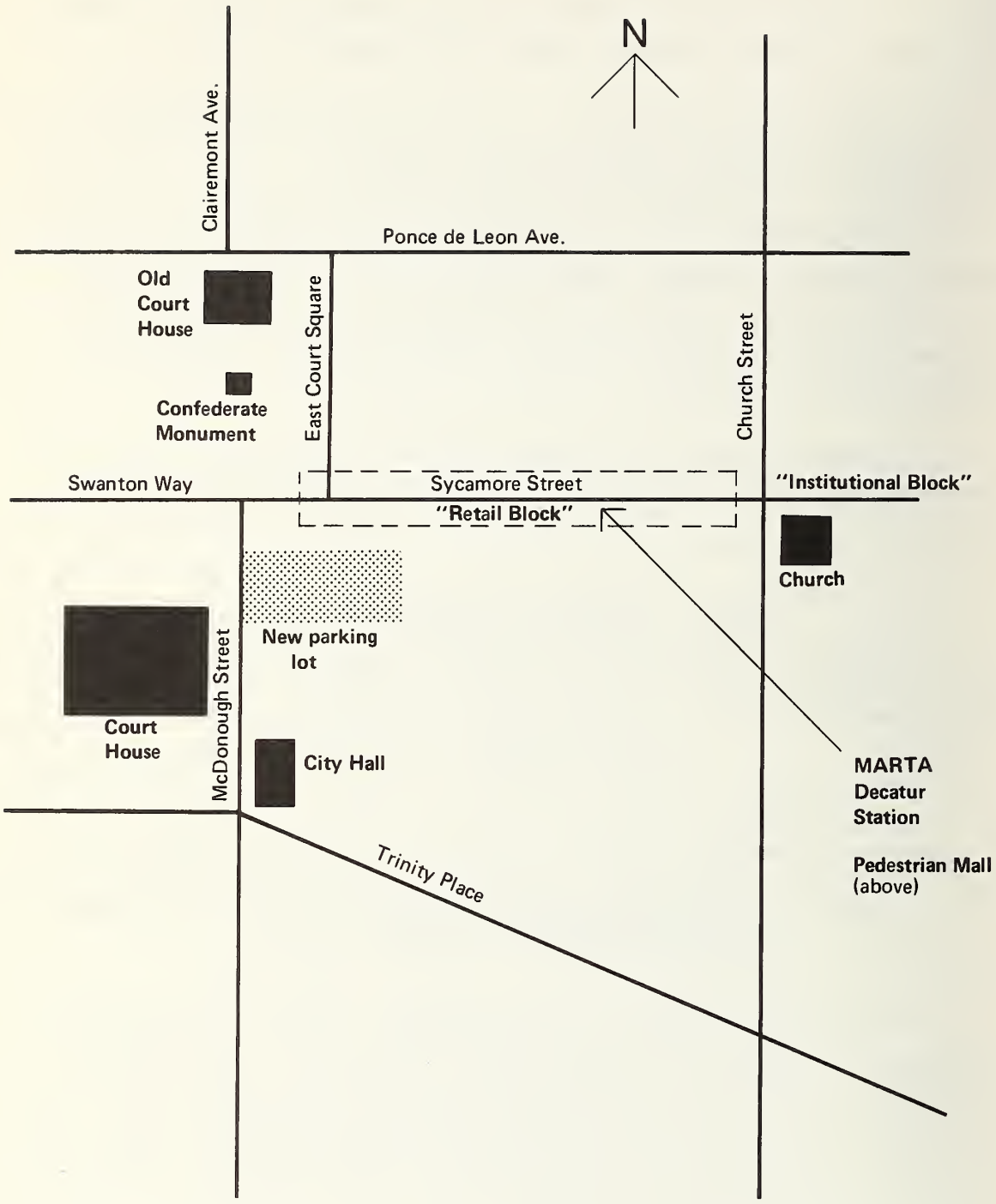

FIGURE 2. DOWNTOWN DECATUR

FIGURE 3. MODEL OF THE DECATUR STATION, LOOKING EAST.
(Photo courtesy of MARTA)

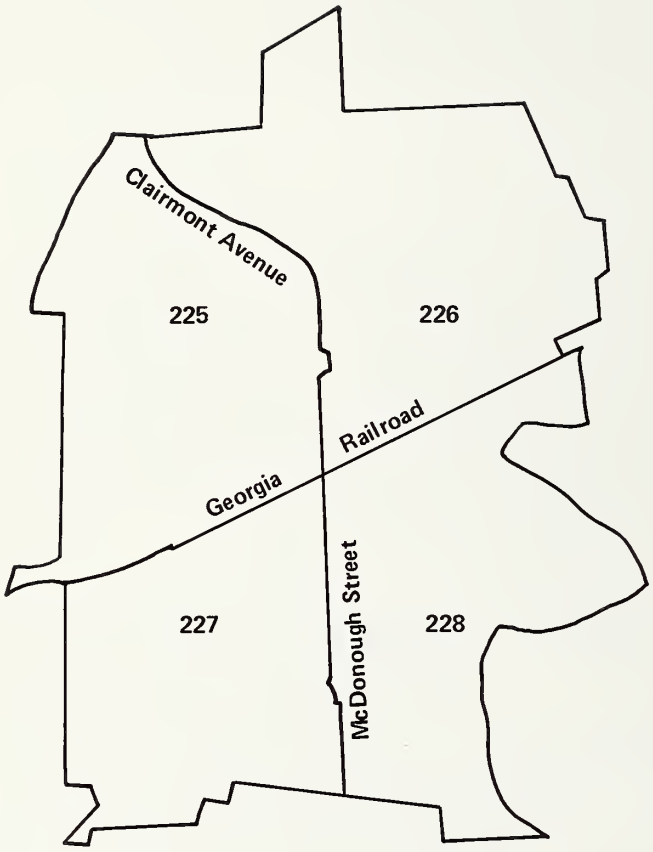

FIGURE 4. THE FOUR CENSUS TRACTS IN DECATUR

FIGURE 3. MODEL OF THE DECATUR STATION, LOOKING EAST.
(Photo courtesy of MARTA)

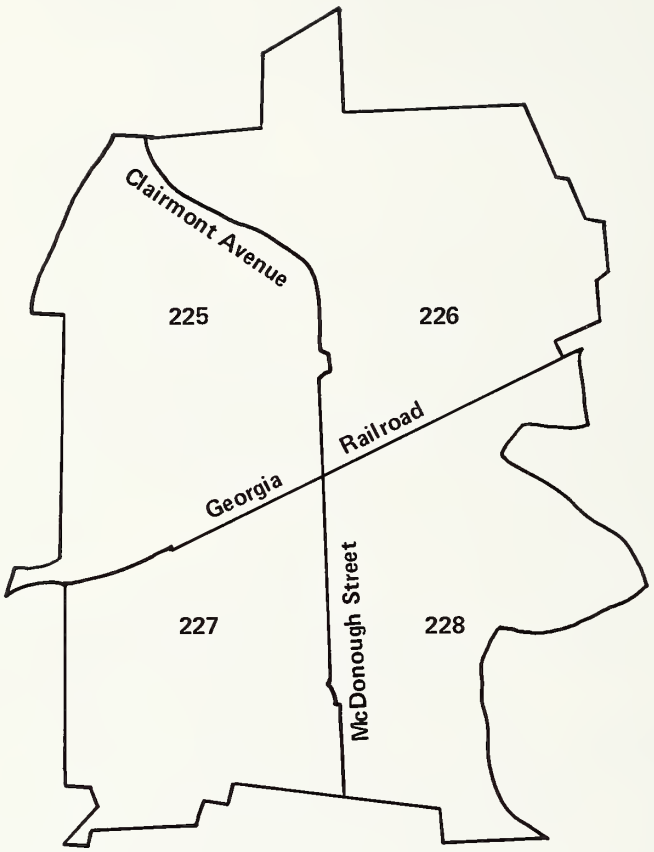

FIGURE 4. THE FOUR CENSUS TRACTS IN DECATUR

TABLE 2. TOTAL POPULATION AND PERCENTAGE OF BLACKS IN DECATUR, BY CENSUS TRACT

Tract No.	1960		1970		1975	
	Total Population	Percent Black	Total Population	Percent Black	Total Population	Percent Black
225	7,396	38	5,965	31	5,143	31
226	5,274	3	4,907	1	4,872	1
227	5,144	0	7,127	77	6,348	77
228	4,212	3	3,944	33	3,499	39

Source: 1975 Population and Housing. Prepared by the Atlanta Regional Commission. Table 8, p.31

It is apparent that Tracts 225 and 226 have a lower percentage of blacks in 1975 than they did in 1960; Tract 226 is for all purposes an all-white tract. Tracts 227 and 228, which are literally on the other (south) side of the railroad tracks have gained tremendous numbers of blacks in the same period. Whereas in 1960, practically no blacks lived south of the railroad, the two tracts now have percentages of 77 and 39 respectively. Altogether, 63% of the population south of the railroad tracks is now black. It should be noted that the MARTA right-of-way goes directly through the remaining concentration of blacks in Tract 225.

The median income of families in Decatur in 1970 was $9,663. This was higher than the median income for urban Atlanta ($8,399) but smaller than the corresponding figure for the entire Atlanta SMSA ($10,695). For the entire U.S., the 1970 median income figure was $9,590, so Decatur was very close to the median.

If we look at the median income of families by census tracts, we find the following:

TABLE 3. MEDIAN INCOME IN DECATUR IN 1970, BY CENSUS TRACT AND RACE

Tract No.	Total Population ($)	Black Population ($)
225	8,915	3,568
226	10,397	not reported
227	8,525	8,188
228	11,051	9,938

Source: City of Decatur, in Application for Federal Assistance to U.S. Department of Housing and Urban Development, for Community Development Block Grant Program

In 1970, Tract 228 was the wealthiest, for both whites and blacks. Tract 226 was the next wealthiest; income for black families was not reported, since there were hardly any in that tract. In Tract 227, whites and blacks seemed to be about equal. In Tract 225, on the other hand, the black median income was far below the white income. This is a reflection of the fact that all three of Decatur Housing Authority's low income housing projects are located in Tract 225. The population of these projects is predominantly black. The three housing projects, Gateway Manor, Allan Wilson Terrace, and Swanton Heights, are shown in Figure 5. The Decatur Housing Authority is now embarking on what is called Phase III of their Urban Renewal Program. In preparation for this, much of the area between West Howard Avenue and West Trinity Place, on either side of Atlanta Avenue, is being razed. No more low-income projects, however, are planned by the Authority, beyond the existing 399 units.

Figure 5 also shows two projects for elderly persons. One is Philips Tower, on Trinity Place, run by the Presbyterian Church. Clairmont Oaks, on Clairmont Avenue about four blocks north of the old Courthouse was put up by the Baptist Church. Both are so-called "Section 236" housing, i.e., privately run but subsidized by the federal government.

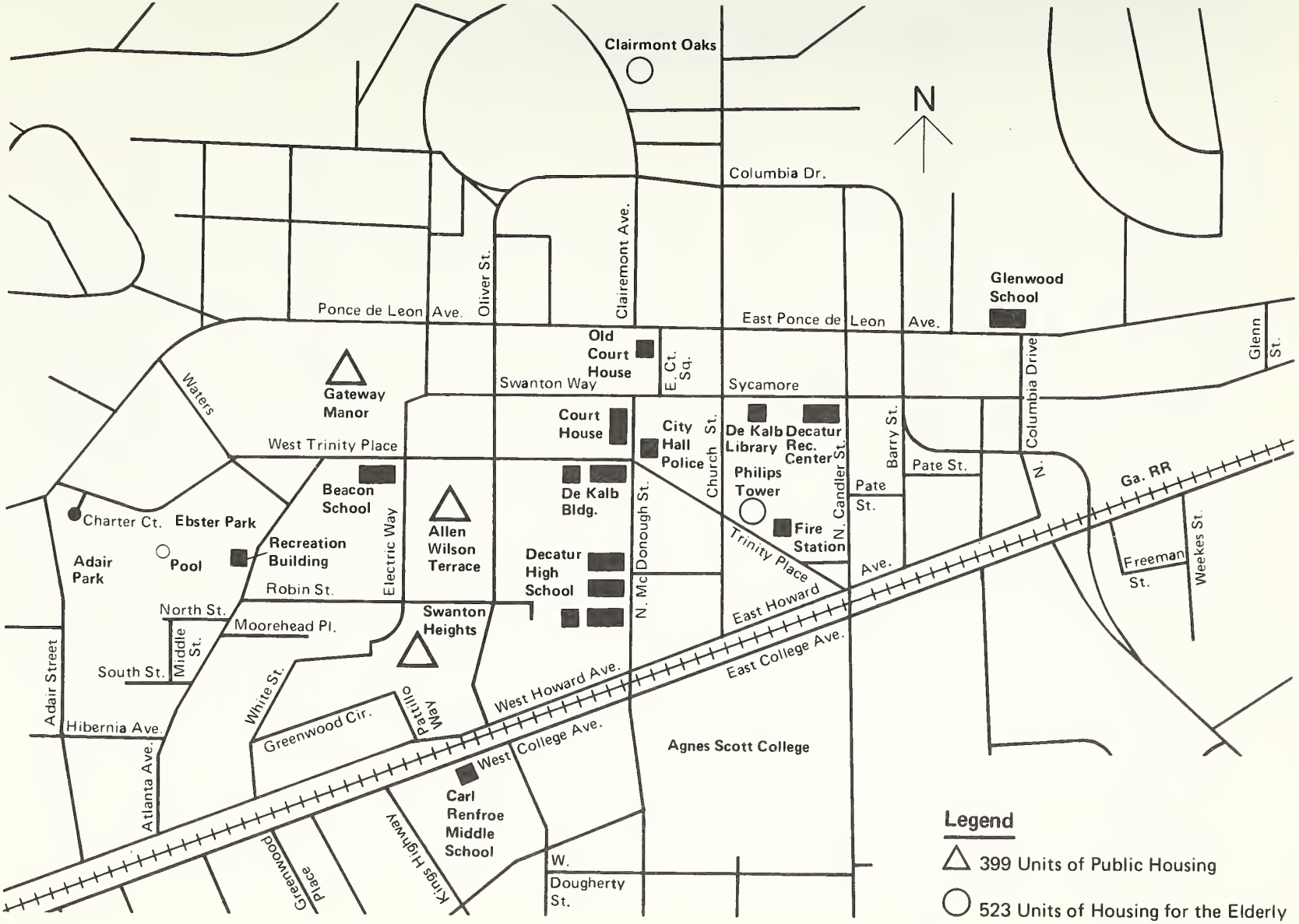

FIGURE 5. CENTRAL DECATUR, WHERE THE SUBWAY IS BEING BUILT

The housing market in Decatur, according to opinions voiced by real estate brokers and residents alike, seems to be rather tight. There are some hard data to confirm this view. The City of Decatur has prepared the following figures:

TABLE 4. OCCUPIED AND VACANT HOUSING UNITS IN DECATUR, NOVEMBER 1974

Occupancy Status and Condition of Housing Units	Numbers of Year-Round Housing Units		
	Total	Owner-Type	Rental-Type
1. a. Occupied units: Total	7093	3617	3476
b. Substandard	526	268	258
c. All other	6567	3349	3218
2. a. Vacant units: Total/rate	125/1.7%	64/1.7%	61/1.7%
b. Substandard	92	47	45
c. All other	33	17	16
3. Total occupied and vacant units	7218	3681	3537

These figures are based on a survey of housing conditions conducted by the Department of Building Inspection in November 1974 and on property tax records. It should be noted that the total number of units in 1974 (7,218) is down from the 1970 figure (7,479, as given by the Atlanta Regional Commission in 1975 Population and Housing, Table 12, p. 47). A note to the figures prepared by the City of Decatur explains that the Decatur Housing Authority has demolished over 200 housing units since 1970.

From this table, it appears that Decatur's vacancy rate in 1974 was 1.7%. This was true of owner-occupied as well as of rental properties. In fact, the true vacancy was probably even lower, since of the 125 vacant units, 92 were substandard and many of them were probably

not inhabitable. Another note to the table explains that 12 of the 92 units were too deteriorated to be even considered for rehabilitation. Of the 61 vacant units available for rental, 45 were substandard. Thus, only 16 units were available for rental, out of a total number of rental units of 3537. This is a vacancy rate of less than one-half percent. For all practical purposes, therefore, there was no rental housing to be found in Decatur in 1974.

The Atlanta Regional Commission also provides figures on land use in Decatur and gives estimates of how this will change from 1970 to the year 2000. In 1970, 1455 acres (out of a total acreage in Decatur of 2636) were given over to single family dwellings, or over 55%. By 2000, the Commission estimates, single family acreage will be down to 1157 or 44% of the total acreage. This is a reduction of 20%. During this same period, the Commission estimates that multi-family acreage will go up from 83 (3%) to 246 (9%). Other uses that are expected to increase are industrial, commercial, and public. Uses that are expected to go down are parks and recreation, from 117 acres to 98 acres. This probably reflects the fact that Ebster Park is expected to be abandoned as part of urban renewal. "Extensive" use -- vacant land in industrial parks, educational campuses and the like -- is expected to grow smaller by 5 acres over the thirty year period. The remaining uses are expected to stay the same.

3.2 THE ROUTE OF MARTA'S TRANSIT LINE THROUGH DECATUR

The rapid transit line that will serve Decatur is part of MARTA's East Line. It begins at the Five Point Station in downtown Atlanta as a direct continuation of the West Line. From Five Points Station east, the rapid transit line generally remains at grade and follows the right-of-way of the Georgia Railroad. Five stations and five miles east of Five Point Station, the line reaches East Lake Station. At this point, the rapid transit line lies just north of the railroad tracks, between the railroad and West Howard Avenue.

At East Lake Road, the rapid transit line enters the city limits of Decatur. Initial plans for the East Line had called for it to continue to follow the railroad right-of-way for another two miles to the Avondale Station, which is the planned terminus of the East Line in Phase A. (Later on, the line is expected to be extended further east into DeKalb County for another three miles to the Perimeter Road -- I-285.) However, the City Commissioners of Decatur saw the rapid transit line as an opportunity for revitalizing downtown Decatur. They therefore asked to have the line diverge from the railroad alignment and go through Decatur's business district. (See Figure 6.)

In the sections below we shall briefly describe the Decatur segment: first, the section from East Lake Station to the downtown Decatur Station; second, the section that includes the station; and third, the section from the Decatur station back to the railroad alignment at the Avondale Station.

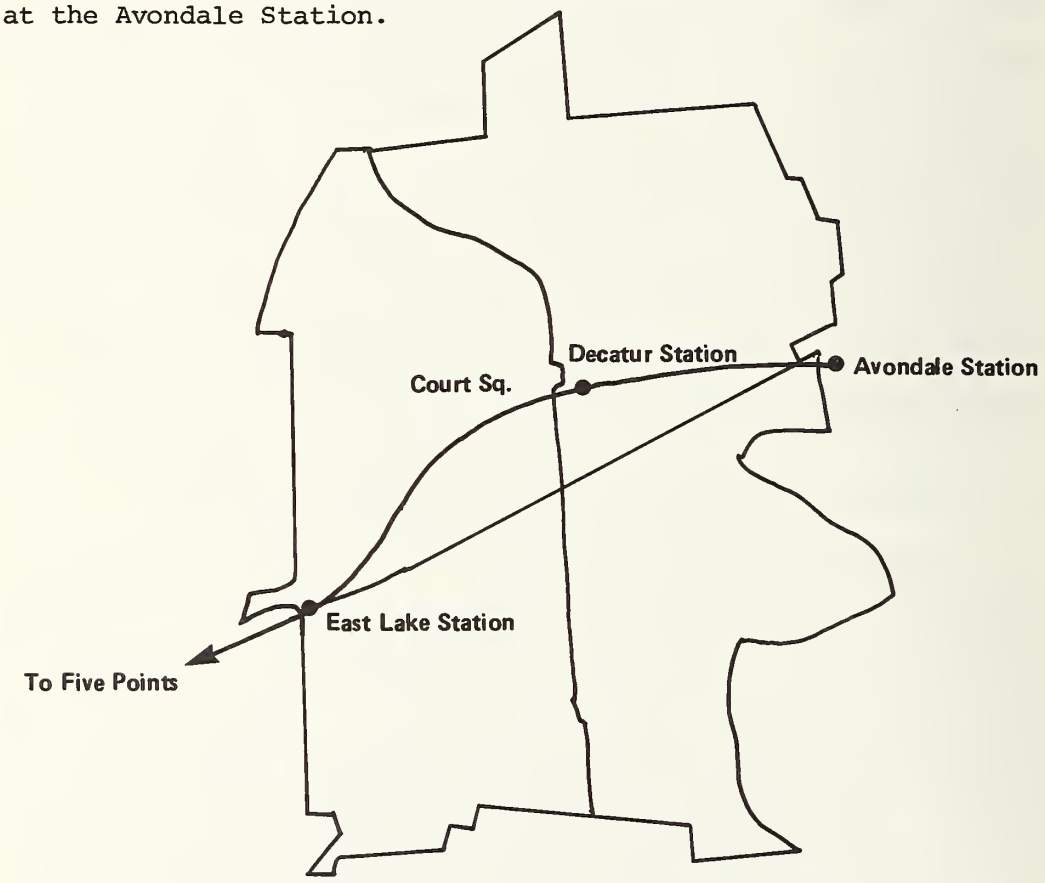

FIGURE 6. THE THREE DECATUR STATIONS

3.2.1 East Lake Station to Decatur Station

This segment of the line, though here treated as one, is being built under two separate contracts (CE 330 and CE 340). The same contractor is building the entire segment and the same resident engineer is responsible for both contracts.

After leaving East Lake Station, the line drops so that it can pass as a subway under W. Howard Street as it turns northward. It continues dropping as it goes under Adair Street and continues in a generally northeasterly direction. The line here does not follow any street; rather it goes underneath what had been the backyards of houses on Adair Street and on Atlanta Avenue. All the affected houses have, of course, been bought by MARTA. The houses on Atlanta Avenue (on the right side as one goes from Lake Street Station north) were all slated to be razed anyhow, for Phase III of the Decatur Housing Authority's Urban Renewal Program. Altogether 2,900 feet of subway box are being constructed here. Since all the land was bought by MARTA and since there is no need to maintain any traffic in the construction area, the subway box is being constructed by the open trench method. (See Figure 7.) It is proceeding rather rapidly, because there are very few external hindrances to cope with. The first concrete was poured at the northern end of the box in May 1976. The construction proceeded from the northern end toward the southern end of the construction. Dirt taken out of the trench was trucked back to the northern end where it was used to backfill over and around the completed box. At the northern end of the construction, there is a portal. Although the subway line is still dropping, the ground below it is dropping even more steeply to form a valley. West Trinity Place runs along the lowest part of the valley in an east-west direction.

After leaving the portal, the rapid transit line crosses the valley and West Trinity Place on an aerial structure. It then swings to the east and enters another portal to become a subway again under Swanton Way.

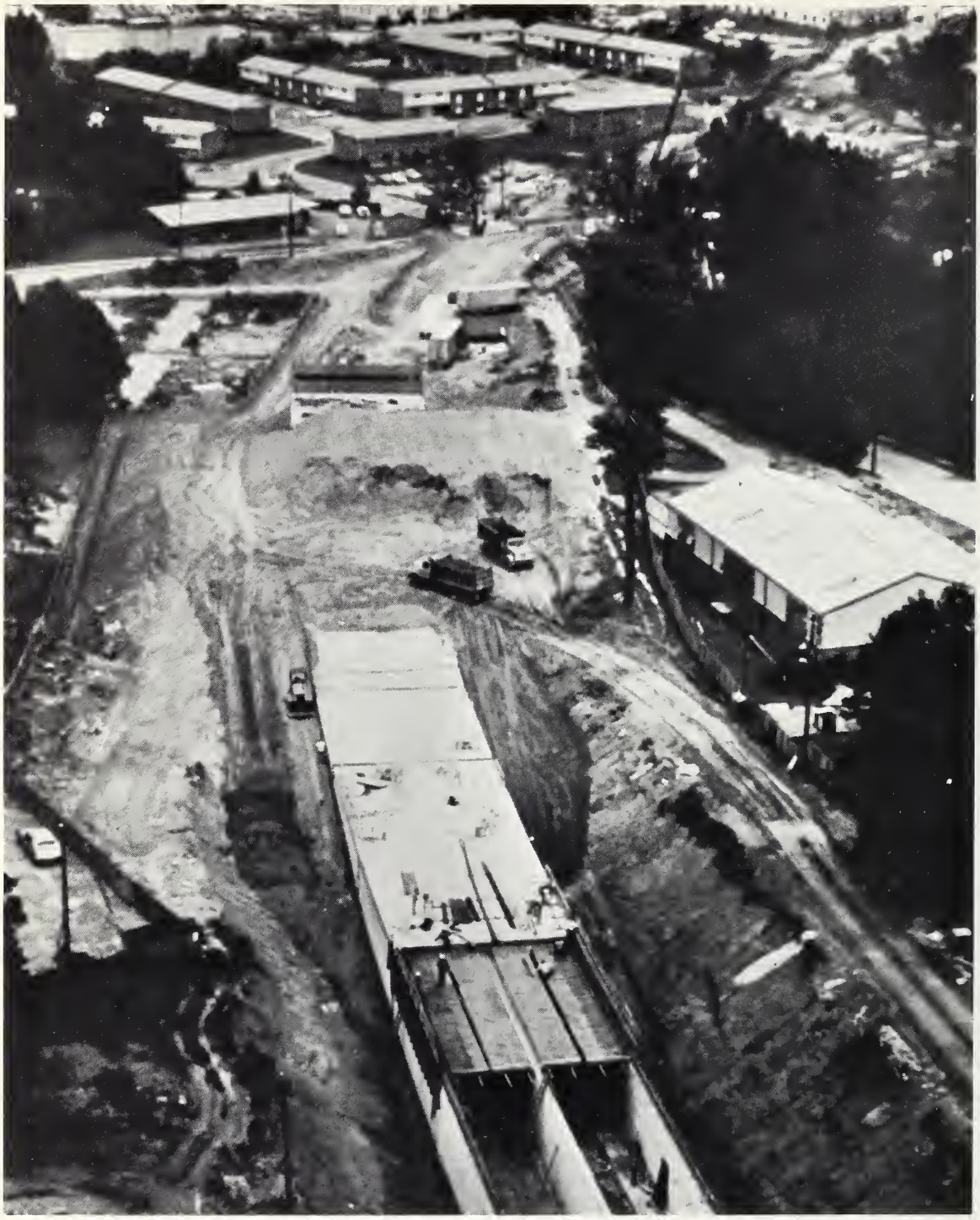

FIGURE 7. AERIAL VIEW OF SUBWAY BOX UNDER CONSTRUCTION LOOKING NORTH. Ebster Recreation Building is the large building at the right. Ebster Pool is just out of the picture on the left. Downtown Decatur begins in the right hand corner; the box can be seen curving toward it, past the two-story buildings of Gateway Manor straight ahead.
(Photo by Bill Mahan, from Atlanta Constitution)

Along its way, the subway trench cuts through Ebster Park; in doing so, it separates Ebster Pool from the Ebster Recreation Center (see Figure 8). After coming out of the Portal, the rapid transit line passes by the Beacon School. It then crosses West Trinity Place, and cuts through Gateway Manor, one of the Decatur Housing Authority's low income projects. Three of the Gateway Manor buildings were taken by MARTA; the line passes within about 20 feet of one of the remaining buildings, before it re-enters the tunnel under Swanton Way.

3.2.2 Decatur Station

The station segment extends from in front of the old DeKalb Courthouse to Church Street. The shell of the station is being constructed under contract No. CE 345. A separate contract will be let later for the finish work on the interior. The station will be 600 feet long and have two entrances: one will be at the old courthouse end, with passengers emerging directly in front of the Confederate Memorial if they turn right after exiting or directly facing down McDonough Street if they turn left (see Figure 3). The other entrance will be at Church Street, at the east end of the station. Figure 9 is an aerial view of Decatur, with the Decatur Station and the adjoining line segments sketched in. The station is basically underneath the retail business block of Sycamore Street. While it is hoped that presence of the rapid transit line and the station will revitalize downtown Decatur, the stores along Sycamore are among the most heavily impacted by the construction, as we shall see in the next chapter. The stores on the north side of Sycamore are all gone, the buildings having been razed by MARTA because of the construction. The stores on the south side of the street are experiencing varying degrees of difficulty.

3.2.3 Decatur Station to Sam's Crossing (Avondale Station)

This segment of MARTA's line is being constructed under contract CE 360. For several blocks after the Decatur station, the line continues

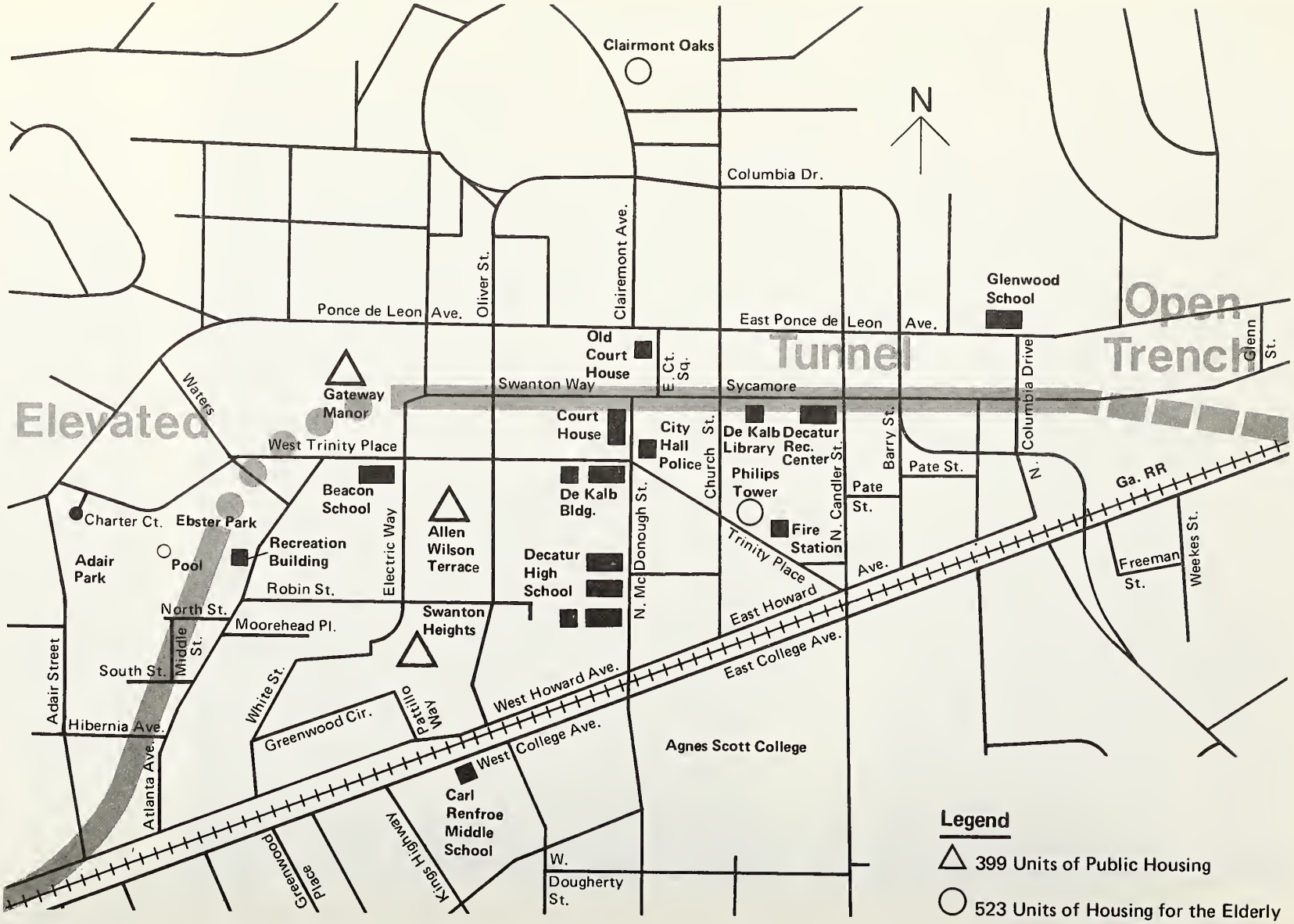

FIGURE 8. THE ALIGNMENT OF THE MARTA RAPID TRANSIT LINE THROUGH DECATUR

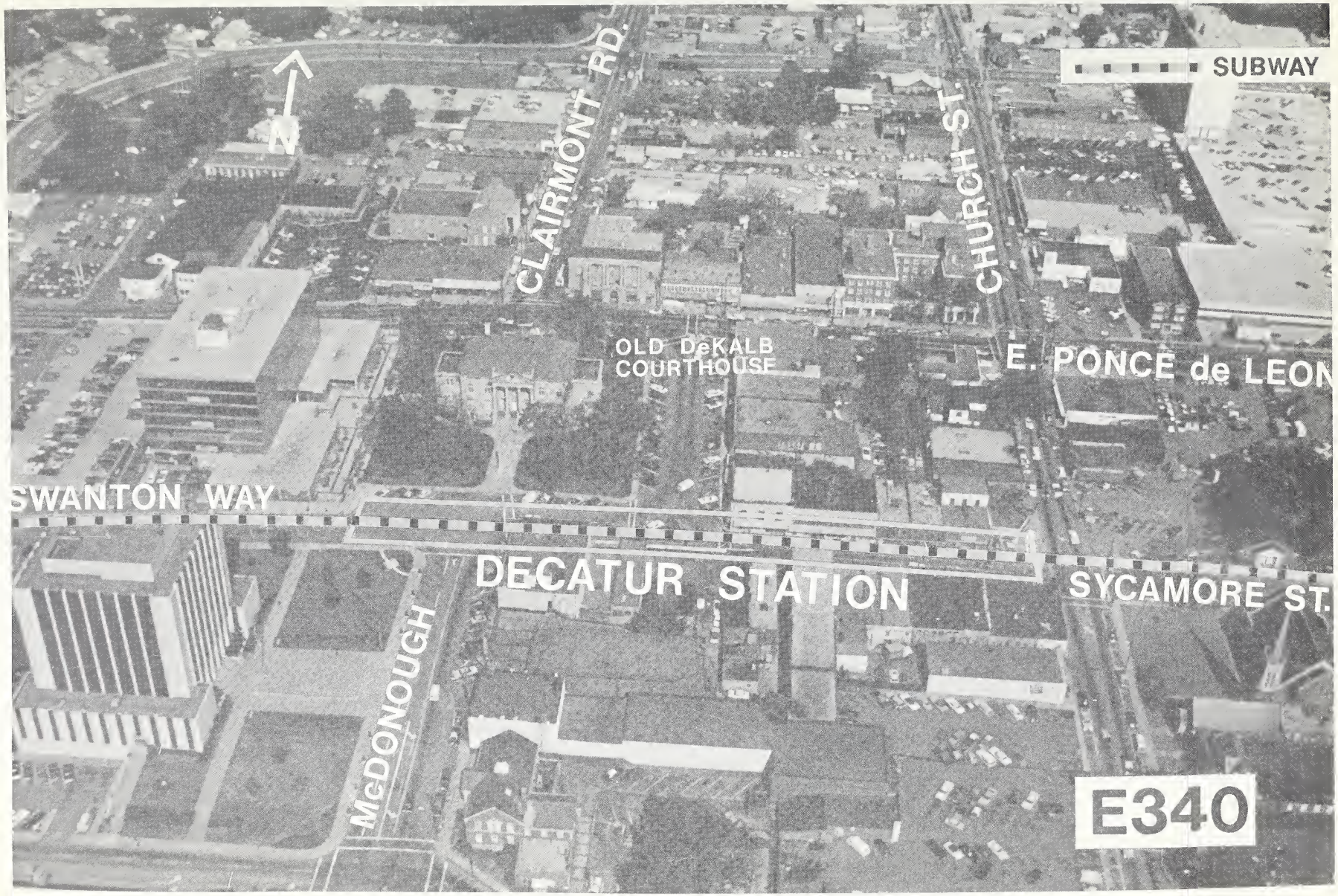

FIGURE 9. AERIAL VIEW OF DECATUR SHOWING LOCATION OF DECATUR STATION
(Photograph courtesy MARTA)

under Sycamore Street. The first block, between Church Street and North Candler Street might be called an "institutional" block. On the south side of the street, there is a church, the DeKalb County library, and the Decatur Recreation Center. On the northwest corner of Sycamore and North Candler Streets, there is a large office building, the 246 Sycamore Building, formerly the Brevard Building. The next short block, from North Candler Street to Columbia Drive, is mainly residential. At the northeast corner of North Candler and Sycamore Streets is a private kindergarten. The south side of the next block, from Columbia Drive to Hillyer Streets, is almost entirely taken up by a series of condominium townhouses, known collectively as Sycamore Square. The remainder of the block and the other blocks of Sycamore to the east consist of single family residences. The only non-conforming use of which the study team was made aware was a nursing home, on the north side of Sycamore Street, between North Columbia Drive and Glenn Street.

Somewhat east of Columbia Drive, the subway comes out of a portal and continues eastward in a trench. It leaves the alignment of Sycamore Street and swings slightly to the south of it. The houses on the north side of Sycamore Street, after the line emerges from the tunnel, are unaffected, but the properties on the south side of Sycamore Street east of No. 327, have all been purchased by MARTA. The rapid transit line then rejoins the right of way of the Georgia Railroad at Sam's Crossing. Figures 10 and 11 are aerial views of Decatur, with the subway line sketched in. It should be noted that these two pictures are not continuous; a section of CE 360 between them is not shown.

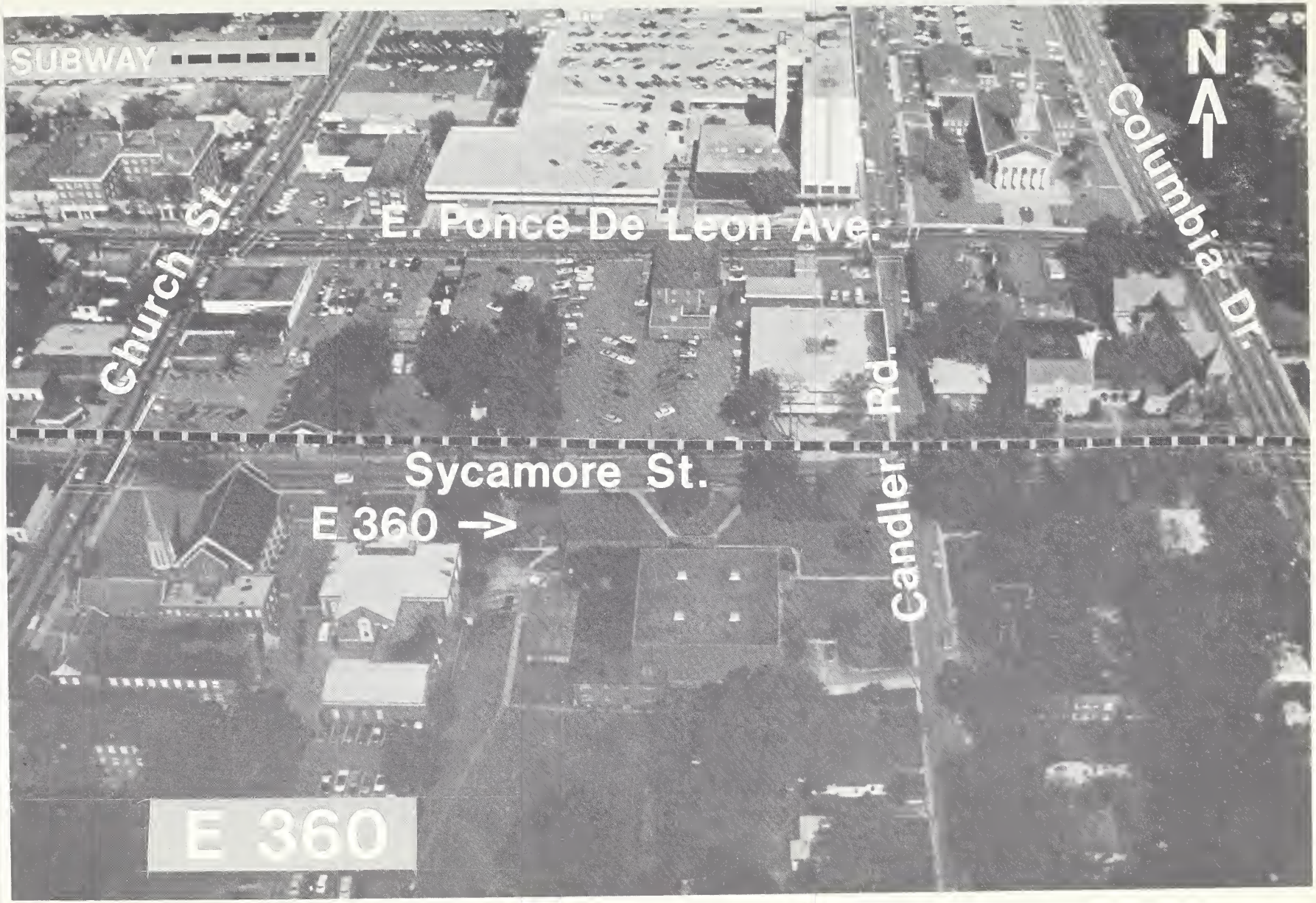

FIGURE 10. AERIAL VIEW SHOWING SUBWAY ALIGNMENT ALONG SYCAMORE STREET
(Photo courtesy of MARTA)

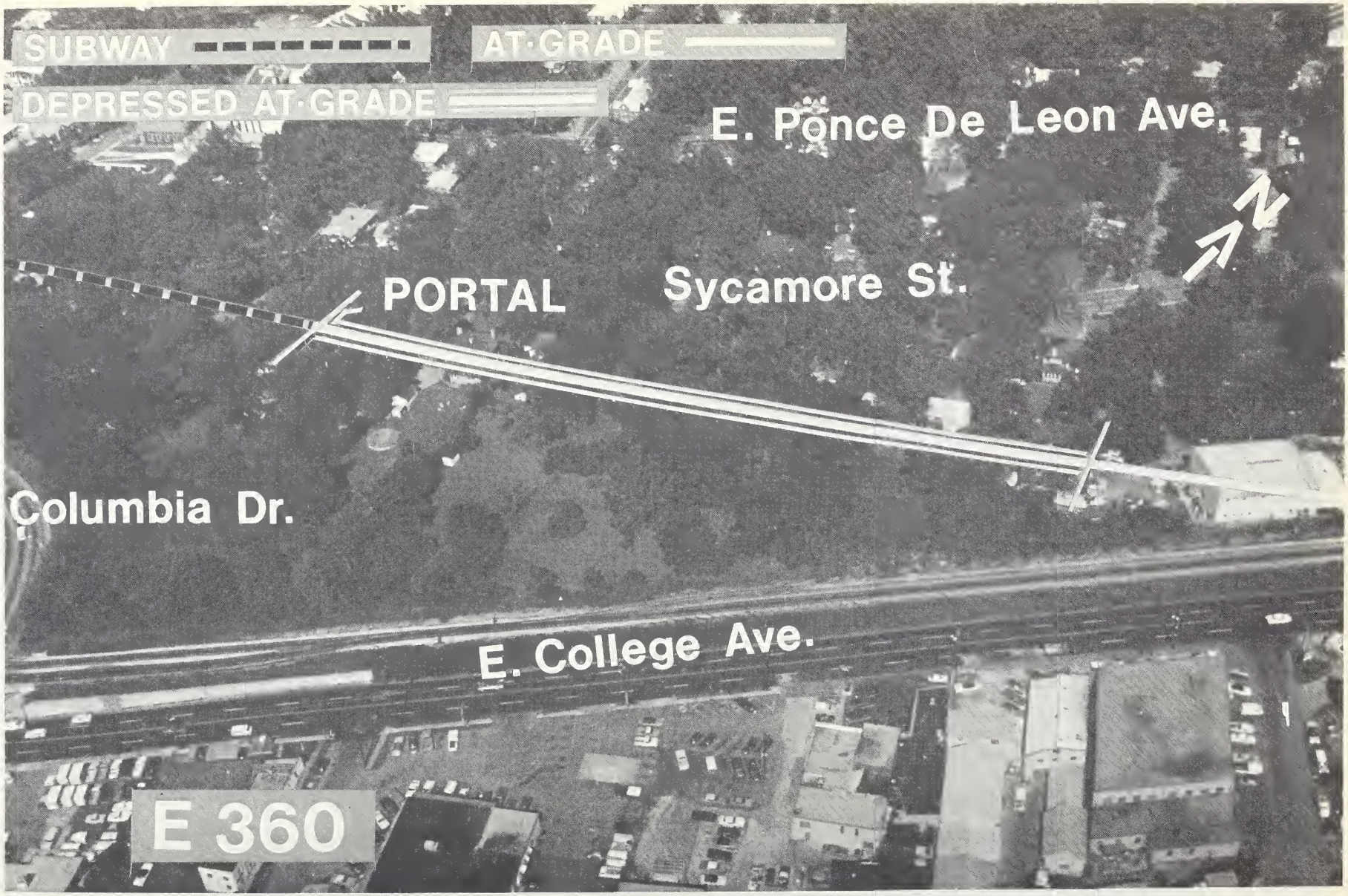

FIGURE 11. AERIAL VIEW SHOWING EASTERN END OF RAPID TRANSIT LINE IN DECATUR. Where the subway comes out of the portal and begins to run in a trench, the alignment leaves Sycamore Street and curves south in order to rejoin the railroad right-of-way. (Photo courtesy of MARTA)

4. IMPACTS OF CONSTRUCTION

4.1 GENERAL CONSIDERATIONS

Before turning to specific impacts in specific locations, we shall consider some general aspects of the impacts in Decatur. What we are concerned with in this section are impacts that actually occurred in Decatur, but which have features that (1) make it likely that they would also be occurring in other construction projects, and (2) enable us to draw some general conclusions about impacts from them.

We shall deal with the following six points:

a. coordination of tunnel construction with other disruptive activities;

b. identification of the most important causal agents and the most severely impacted groups;

c. the duration of the impacts;

d. the roles of the owner, the engineering firm, and the contractor in identifying and mitigating impacts;

e. the roles of different levels of government in identifying and mitigating impacts; and,

f. mitigation measures that were actually implemented or attempted.

After considering each of these general points in turn, we then shall turn to specific impacts.

4.1.1 Coordination of Tunnel Construction with Other Disruptive Activities

There are two different kinds of alignment that we encounter in the Decatur segment of MARTA: part of the line runs through and under private property (at the western end of the segment and again at the eastern end), while another part of the line (the middle portion) runs under public property, namely public streets.

The portion of the line that runs between Adair Street and Atlanta Avenue is being built very rapidly. This is due at least in part to the fact that the construction is not under a street. Since no traffic has to be maintained and since the houses on Atlanta Avenue have all been bought and razed, either for MARTA or for urban renewal, the contractor is able to proceed at will. Basically, there is nobody left to be disrupted and so disruptions are not a worry or a cause for slowdown. Things are similar at the eastern end of the construction, where the construction also is proceeding apace, though not as spectacularly as in the western segment.

The fact that MARTA construction is going on in an area that is temporarily uninhabited (because of urban renewal) is keeping the disruption down. Rather than there being two different disturbances (first the urban renewal and then the tunnel construction) there is only one. As we noted in the Final Report of Phase I, this kind of coordination of plans lessens construction impacts (op.cit., p. 151).

Of course, there is another way of looking at the coordination of urban renewal and MARTA construction: urban renewal appears to be removing black residents from one of the few pockets of blacks north of the railroad and the MARTA construction is an additional factor in this demographic change. As a result of the coordination between the Housing Authority and MARTA, few blacks will be left north of W. Howard Streets. Ebster Park and Pool, two islands of black activity in a white neighborhood, will be removed and de facto segregation restored to Decatur. Nevertheless, coordination of different construction activities does result in a significant lessening of social, environmental and economic disruptions for Decatur as a whole.

When we look at the portion of the line that goes under public streets, we see an altogether different picture. There is a great deal of disruption here, construction proceeds much more slowly, and residents and businesses near the construction are badly affected. Many of the

affected persons would apparently prefer to have had their properties purchased by MARTA, so that they would not have to suffer the on-going construction. Properties, of course, are purchased only when they must be taken because the construction could not otherwise proceed; they are not purchased merely in order to save the owner discomfort or disruption.

We must also be careful not to imply that taking properties in the line of construction eliminates disruptions. First, some people prefer to remain in their homes (or businesses) even while the construction is going on. Being forced to leave greatly disrupts the lives of the relocated people. Second, by taking properties one simply substitutes one kind of disruption for another: instead of having their lives disrupted continuously for two or three years by a number of annoyances (like dust, noise, limited access) people's lives are suddenly changed completely when they are forced to move elsewhere (with a loss of friends, neighbors, services, etc.). Third, it must be remembered that taking properties is an expensive undertaking. In the case of Atlanta Avenue, the homes were being taken for an urban renewal project. Consequently, a very wide right of way was cleared, and MARTA needed to buy only a narrow strip of right of way. If MARTA had had to buy all of the properties through which the rapid transit line travels, the cost might well have been prohibitive.

In sum, then, taking properties and working in an area totally owned by the transit authority certainly speeds up construction and minimizes the disruptions caused by the mechanical process of construction. To purchase all the required properties, however, may well put intolerable financial burdens on the transit authority (except in special circumstances) and unacceptable emotional traumas on large numbers of persons.

4.1.2 The Most Important Causal Agents and the Most Severely Impacted Groups

As part of the effort to "prune the matrix" (see Section 2.5), that is, in order to concentrate effort and resources where they were most needed, it was important to identify the most important causal agents of disruption and those groups that were most severely affected by construction impacts.

The judgment of which impacts were the most important (that is, the most disruptive) is based on the interviews which we conducted and on what on-site inspection revealed. Certain causes and events were mentioned again and again by residents and merchants as having affected them greatly. Often these same events were also mentioned by city officals and showed up in the complaint files which the resident engineers kept. For example, the extended closure of Church Street was cited as causing impacts by the manager of a supermarket on Church Street, by several merchants on Sycamore Street, by elderly residents of Philips Tower, by personnel of the Decatur Health Center, by the city manager, and by the resident engineer for this segment of the line. We took this as evidence that this specific closing, and barrier effects in general, ranked among the most important disruptions in Decatur. From evidence such as this, we concluded that the most important causal agents in Decatur were (1) denied or difficult access (barrier effect), (2) mud and dust, (3) noise.

Similarly, the most severely affected groups appeared to be (1) retail merchants along Sycamore Street from McDonough Street to Church Steet, (2) residents along Sycamore Street from North Candler Street to approximately Glenn Street, (3) residents in Gateway Manor. The judgement that these were the groups that suffered most is based again on the fact that their complaints were voiced most often and loudest to the study team, to city officials, or to the resident engineers. Taking into account what the affected groups said, either

in interviews or in written complaints, and what we saw with our own eyes in Decatur, we also attempted to rate the severity of the impacts caused by these causal agents on these groups.

Figure 12 is a reduced version of the matrix appearing in Phase I to take account of only these three populations and these three causal agents. The words "high," "medium," and "low" in the cells indicate where, in our judgment, the most severe impacts occur. I.e., for retail businesses, denied or difficult access results in the most severe impact; hence the word "high" is put in that cell.

Causal Agents / Affected Groups	Denied or difficult access	Mud and/or dust	Noise
Retail businesses on Sycamore St. from McDonough to Church St.	high	medium	low
Residents of Sycamore St. from N. Candler St. to Glenn St.	low	high	medium
Special population (black and poor) of Gateway Manor Housing Project	high	low	medium

FIGURE 12. A SEGMENT OF THE PHASE I MATRIX TO SHOW THE LOCI OF THE MOST SEVERE IMPACTS IN DECATUR

These findings are probably generalizable to other subway construction projects. When access to retail businesses is difficult or impossible, their sales are going to fall off, because customers cannot or will not reach them. Impeding the access to the housing of the poor is a more severe impact than for the well-to-do, since transportation is a more difficult and costly problem for the poor. They

rely heavily on taxis, buses, and walking to get from one place to another. All of these modes are seriously disrupted when tunneling produces a barrier effect. Middle class residents are going to object more to dust, mud, and noise than to difficult access, since they are usually proud of their homes, have a large investment in them, and are concerned about neighborhood property values. Such residents can more easily cope with difficult access, since they usually have one or two automobiles at their disposal.

In sum, it behooves us to pay special attention to these three groups and these three causal agents, both in Decatur and elsewhere, in order to get a sense of the severity of impacts and some notion of how impacts might be mitigated.

4.1.3 Duration of Impacts

We found, not surprisingly, that the longer impacts last, the more severely they are likely to be felt. What is endurable for a day may be difficult to accept for a week and intolerable over a month. What is a temporary slowdown of sales receipts for a business may turn into a year-long loss or finally into a situation where the business is better off to close its door and avoid fixed costs than to try to stay open. Our investigation in Decatur provided us with some hard data on this economic aspect of construction impacts.

There is also evidence that environmental impacts -- noise, dust, mud, and visual deterioration -- may be suffered in silence for only a short time. If these impacts last long, objections -- sometimes violent -- will be raised. This is particularly true of noise. Tolerance for very loud and painful levels of noise is of very short duration. Highly indignant letters and complaints concerning construction noise in Decatur were addressed to MARTA, the resident engineers and the contractors.

Some impacts last a great deal longer than necessary, because mitigating measures are not taken. If the required mitigation is easy to implement, and if it becomes apparent that it has not been implemented merely because of lack of interest or a sense of urgency, then the disruption will be perceived as even more severe than might otherwise be the case. Gateway Manor presents a good example of this: Since access to West Trinity Place was made difficult, the residents attempted to gain better access to the north (toward the downtown area) by carving steps out of an embankment. Although this was a good temporary solution, the steps were steep, hard to negotiate, and subject to severe erosion during rain. The Public Relations office of MARTA tried to get a permanent set of wooden stairs constructed on the embankment, in order to give the residents better access to downtown Decatur. The steps were first carved out of the mud in July; it took until the middle of December to install the permanent stairs.

4.1.4 Owner-Engineer-Contractor Responsibilities in Impact Avoidance and Mitigation

All three organizations are involved in "causing" impacts and all three are obligated, in various ways, to try to avoid or minimize them. The interests of the three parties are not, however, identical or even parallel. Nor are the interests of any one party necessarily always consistent.

The owner (i.e., the Transit Authority) probably has the greatest interest in mitigating and/or minimizing impacts. MARTA is a transit authority that was set up by the Georgia legislature in March 1965. In November 1971, MARTA submitted its Rapid Transit plans to the voters in five counties. The MARTA plan was narrowly approved in Fulton and DeKalb Counties, and failed in two adjacent counties. Thus MARTA must be sensitive to the fact that the voters, on whom it ultimately depends for its life and its funds, view rapid transit in an equivocal manner.

Any large impacts caused by the construction process which might raise a hue and cry would not serve MARTA's interests. This is especially true because construction (as for all rapid transit projects) proceeds in stages. If stage 1 is so disruptive as to cause major discontent among the persons in the area, construction in stage 2 might be held up (at great increase in cost) or, at worst, might be abandoned altogether.

In 1973, the Atlanta Regional Commission published a working paper called Business As Usual. It described the effect of rapid transit construction on business activity in the San Francisco Bay Area and in Washington, D.C., and gave suggestions as to what Atlanta might do to avoid or mitigate some of these effects. Then, in June of 1975, still before actual rapid transit construction had begun, the Atlanta Journal ran a series of articles describing the impact of subway construction in Washington, D.C. (particularly along G Street) on retail merchants and their customers. This had a notable effect in alerting Atlanta merchants to what was coming. The series may have had a decided influence in the decision to construct the downtown segment of the North Line by deep rock tunneling. The experience of Decatur's Sycamore Street merchants may also be expected to have an influence on how favorably or unfavorably future MARTA construction plans are received.

At the same time, the owner (i.e., MARTA) must try to do everything possible to control construction costs. Just "normal" delays and inflation tend to raise construction costs beyond first estimates. Any additional increases must, if at all possible, be avoided. If, therefore, avoidance or mitigation of impacts raises costs, the owner is likely to shy away from such actions. Thus, the decision to construct the rapid transit line in the Peachtree Street corridor by deep rock tunneling was no doubt facilitated by calculations that showed that this manner of construction would not only avoid a large number of disruptions, but would also be no more expensive than cut-and-cover construction. In

Decatur, on the other hand, no construction method other than cut-and-cover or open trench was considered, because of the obvious greater expense for boring as compared to these.

The contractor's priorities have to be all on the side of speed. He has made a bid to construct a segment of line or a station, for a certain price. The more rapidly he can complete his work, the more profitable it will be. Mitigation measures often will not only cost money, but more importantly will slow his progress. For example, decking a street to maintain traffic while construction is going on underneath will slow construction compared to how rapidly it could proceed if there was easy, continuous access to the construction site all along the street. The contractor, therefore, can be expected to institute only those mitigation measures which he was obligated to do by the contract documents or existing regulations (such as OSHA regulations, city ordinance and the like).

There is evidence that this expected behavior did in fact occur in Decatur. Contractors permitted their dump trucks to spill dirt and mud on the street, overloaded them, and were reluctant to take measures to stop the erosion of soil during rainfall. Each of these events can be avoided, but only at some cost and some increase in time. On the other hand, one of the contractors did agree to (and did in fact) finish the very noisy pile driving near the Beacon School during the summer months, when school was not in session and, therefore, the learning process would not be disturbed by excessive noise.

The engineer in this -- as in many other matters -- is in the middle. He is responsible to the owner to see to it that work is performed according to specifications, but also in a timely fashion. If he should unreasonably insist on adherence to the letter of specifications, he may delay the progress of the work (at an increase in cost and at possibly an increase in disruptions due to the lengthened time). If , on the other hand, he tries to get the contractor in and out of a given

site too rapidly, he may encourage intolerable levels of disruption, leading to complaints from residents and ultimately to action by the owner. One of the major duties of the resident engineers (who are employees of the engineering consortium) in Decatur is to handle complaints from residents and to see to it that action, where appropriate, is taken. Complaint files are kept by the two resident engineers in the Decatur segment and residents are encouraged to call the engineers with complaints. (There is also a MARTA "hot line" number to call for information or answers to questions about the construction.)

The system seemed to work pretty well in Decatur. Both resident engineers endeavored to minimize disturbances and to keep residents informed of progress of the construction. One of the resident engineers visited the Beacon School to tell the children about the upcoming construction (and incidentally to warn them of possible dangers). He also finally got the contractor to build the permanent stairs for Gateway Manor (though it took over five months). The other resident engineer is highly visible and is well regarded. At least one local businessman who was exceedingly unhappy with MARTA and the contractor went out of his way to say that the resident engineer "is a good boy... but what can he do?" Several residents expressed the view that the resident engineer did what he could. This particular resident engineer also has a very cooperative contractor who, for instance, has distributed flyers to all the residents along Sycamore Street to tell them of what construction events were anticipated to take place during the next few weeks. This information dissemination effort was much appreciated by all those to whom we talked.

A general conclusion that can be drawn is that there is an uneasy balance between the interests of owner, engineer, and contractor. Any attempt at dealing with disruptions will have to take into account the diverging interests of these three parties. It is probably soundest to work through the engineer, since he interfaces with both of the other two interested parties.

4.1.5 Local Government's Role in Identifying and Mitigating Impacts

The construction of the rapid transit line is being undertaken under the auspices of MARTA, a multi-county authority, that was created for the purpose of constructing and operating transit lines in the metropolitan Atlanta area. The impacts of MARTA construction are felt in much smaller areas -- cities, towns, or neighborhoods. It is very understandable that in Decatur residents and businesses who feel themselves aggrieved by construction disruption should turn to their local government, i.e., to officials of the city of Decatur, for remedy. At first blush, this seems to be a case of David and Goliath. Decatur, with a population of about 20,000, expended slightly less than six million dollars in the fiscal year ending June 30, 1976 (for the general fund, for schools, and for debt service). In contrast, MARTA serves the populations of Fulton and DeKalb Counties; their combined populations in 1970 were slightly over a million persons. For the year ending June 30, 1975 (the latest for which figures were available) MARTA's operating expenses were over 38 million dollars. The total budget for the same period which included funds allocated in that year for rapid transit construction, was over 183 million dollars.

Like the biblical David, however, Decatur has some strong weapons to use against MARTA and has won some battles. MARTA construction, like all construction in Decatur, requires building permits which are issued by the city engineer's office. The permits specified that MARTA's work would be done without causing excessive dirt or mud, and that public ways, like sidewalks, would be kept open. Some streets, of course, had to be closed because of the construction. Such closings require permits from the city and conditions were attached to these permits (such as requirements that construction begin immediately after the street had been closed).

When work started in earnest on MARTA construction in Decatur, during the summer of 1976, the City of Decatur received a large number of complaints that the contractors were not, in fact, abiding by the

conditions; the City in turn passed these complaints on to the engineering firm (a joint venture of Parsons, Brickerhoff, Quade and Douglas, Inc. and Tudor Engineering Company). The engineering firm, through its resident engineers, notified the contractors of the violations and, occasionally, threatened them with a shut-down of their job or hold-up of progress payments. At least once, in the course of the summer, the conditions became so unacceptable to the citizens of Decatur, that the City Manager of Decatur wrote directly to the General Manager of MARTA (thus bypassing the engineering firm and the contractors) to complain and to threaten total shutdown of the construction on Decatur Station unless conditions improved.

Evidently, the threats did some good. The correspondence indicates eagerness on the part of MARTA to comply with all applicable regulations and the work went on. At the times that the study team visited the Decatur area, no threats of further shutdown were apparent.

We can conclude, then, that local government has an important role to play in the prevention and amelioration of disruptions: on the one hand, it can be and must be responsive to local citizens who elect the local officials; on the other hand, it also has some leverage to use against the "supergovernment" (as a transit authority tends to be), through its power to issue or withhold needed permits for construction, for closing of streets, and similar activities.

4.1.6 Mitigation Measures Actually Implemented in Decatur

As the previous section indicates, attempts have certainly been made in Decatur to mitigate the disruptions being caused by the rapid transit construction. Probably the most effective measure taken -- and one which served both MARTA's interests and those of the affected citizens -- was to construct a portion of the line through (and under) land slated for urban renewal. This meant that the disruption caused

by the subway construction occurred at a time and in an area where there were no residents to be disrupted: houses were already in the process of being vacated when construction began.

Measures to attempt to mitigate the disruptions caused by difficult or denied access (for either cars or pedestrians) met with varying degrees of success. Access was a relatively unimportant problem where the rapid transit line traversed the urban renewal area. Since the route went through a previously cleared site, very little traffic rerouting was needed. The only major problem in this area was impaired pedestrian access to Ebster Pool, resulting in diminished usage of that facility.

Pedestrian bridges were constructed over the excavation for the Decatur station, in order to maintain access to the Sycamore Street retail stores. Furthermore, the closures of the cross streets along Sycamore Street were phased so that one street had to be reopened before another one could be closed. The long delay in getting Church Street reopened therefore affected the timing of when Candler Street (the next street east) could be closed.

Other traffic interference is simply being accepted, not mitigated. The streets that are being torn up for the tunnel construction are not being decked and so no vehicular traffic is possible, for example, along Sycamore Street. Pedestrian traffic along Sycamore Street is possible, but is unpleasant, occasionally difficult, and sometimes dangerous. Where streets cross Sycamore Street, decking will be provided to maintain traffic, but even here, there seems little sense of urgency. Church Street, one of the most important north-south arteries in Decatur, was closed for months, while the wooden bridge over Sycamore Street was under construction. The only answer to the question why more is not being done to maintain pedestrian and vehicular access seems to be that nothing more <u>can</u> be done. As long as this type of construction is being used, there will be traffic disruptions and inconveniences and nothing can be done about them.

Takings are in some sense the most serious of all disruptions: they force a business out of its accustomed area where customers know it and they force residents to move into new neighborhoods and to undergo all the trauma associated with a move. Nevertheless, takings do not seem to produce the kind of citizen action that other disruptions do. Perhaps this is due to the fact that there are well established procedures for how to deal with takings; they are embedded in Public Law 91-646. These procedures apply to all relocations caused by projects in which federal money is involved. Thus they are applicable to the relocations caused by MARTA. Failure to abide by these regulations could result in denial of federal monies.

Another reason, of course, why the study team heard little about disruptions caused by moving is that those who were disrupted (i.e., moved) were no longer there to talk to us. All the takings in the Decatur area had already happened. This has to be the case: construction cannot start until the transit authority owns the land which it needs. Thus it is not really possible to say how severly affected the relocated persons felt themselves to be.

Most of the apparent efforts were expended on ameliorating the environmental effects of the construction -- noise, mud and water, dust, the ugliness of open trenches and construction materials. The complaint files, which we touched on in the previous section, reveal that most of the complaints dealt with these kinds of impacts and that most of the effort of the City of Decatur, of the resident engineers, of the contractors and of MARTA dealt with these matters. This may in part be due to the fact that these kinds of disruptions are very readily apparent, and in part to the fact that means are often available for dealing with them. Noises can be muffled; water can be directed away from streets, dump trucks can be covered, construction storage areas can be fenced, and so forth.

The general conclusion, then, is that mitigating measures were instituted in Decatur and are likely to be instituted elsewhere. However, in Decatur they concentrated on those impacts that could be readily identified and readily dealt with, whereas those impacts that were less easy to identify or less easy to mitigate, tended to be neglected. Among those difficult to identify were impacts resulting from relocation, while among those difficult to mitigate were those resulting from restricted access. Unfortunately, the impacts which were mitigated may not have been either the most severe ones or those of the longest duration. Whether something can or should be done about this point in future construction is something worth investigating further.

4.2 SPECIFIC IMPACTS: SOCIAL, ECONOMIC, ENVIRONMENTAL

In this section we shall consider specific impacts that were actually observed by the Abt Study team or that were reported to us by residents or business persons along the right of way. As much as possible, we shall give specific and quantitative data. For the sake of confidentiality, however, we shall not mention residents' names, nor give actual dollar figures for sales, profits and the like even where they are available (which is true in only a few cases).

In enumerating and discussing these specific impacts, we shall once again proceed along the rapid transit route from west to east, beginning near the East Lake Station and ending near the Avondale Station.

4.2.1 The West Howard Street-Adair Street Neighborhood

As it departs from its path along the Georgia Railroad to head toward the Decatur Station in midtown Decatur, the rapid transit alignment first passes through the West Howard Street-Adair Street residential neighborhood. This area consists primarily of rather closely spaced, modest-sized wood frame houses. The residents, almost all of whom are white, are a mixture of homeowners and renters, and incomes

range from low to lower-middle levels. A substantial number of the residents are elderly. From our observation and interviews with residents, we learned that property values in this neighborhood are declining relative to the overall real estate market in Decatur; owner-occupied units are giving way to rental units. The transit construction may be accelerating this trend somewhat. Its role is not clear, however, for most of the construction work takes the form of an open trench through undeveloped land in the rear of residential properties.

West Howard Street was completely closed to through traffic for about six weeks along the block from Lansdowne Avenue to Adair Street, to permit excavation for the concrete box that will house the rapid transit line as it diverges from the Georgia Railroad to an alignment traveling northeast (between Atlanta Avenue and Adair Street) en route to the station in Decatur center. Once the cut was completed, it was decked, blacktopped, and traffic was once again able to travel over it.

For the duration of the closing, access was a problem for West Howard Street residents. Those who lacked alternate access to their homes had to park their cars at the end of the block and hand-carry any parcels over the distance between car and house. The street closing also necessitated rerouting a bus from Howard Street to College Avenue. This required bus users to cross the railroad at either East Lake Street or Atlanta Avenue in order to reach the nearest bus stop.

Construction-generated dust, which settled on the exterior and penetrated the interior of West Howard Street houses, was the impact most frequently mentioned by residents. Next to the access problem, dust has been the greatest nuisance to people. Dust has added to residents' house-cleaning chores and prevented many without airconditioned homes from opening their windows as usual.

Residents also complained about noise associated with the construction, particularly from pile driving. Although piles were augured to the depth of buildings,they were driven the final distance. Auguring thus mitigated the noise of pile installation, but did not

eliminate the problem. One resident recalled being disturbed by construction noise at 7:00 a.m. on a Saturday morning.

Construction-generated vibration appears to have caused property damage in a few instances. One resident suffered three broken windows and another cited a large crack in an exterior retaining wall. A third resident complained to the Resident Engineer's office about cracked plaster inside the house. The first two residents mentioned the damage in interviews with Abt researchers, but said they had not registered complaints to anyone directly connected with the construction, such as MARTA, the contractor, or the Resident Engineer. The third resident, who did contact the Resident Engineer, was compensated following a visit by an insurance agent.

A continuing nuisance to neighborhood residents has been dirt spillage from trucks hauling excavation spoils along Adair and Howard Streets and Atlanta Avenue. Although sweepers are employed to keep the streets clear of spillage, sweeping is far less effective than covering the trucks would have been, or enforcing the maximum load limits (which would have prevented the dirt from being piled so high on the trucks).

4.2.2 Lansdowne Avenue

Lansdowne Avenue, which runs north off West Howard Street, one block west of Adair Street, is the westernmost street in this neighborhood to be affected by the subway construction. Construction impacts mentioned by residents of Lansdowne Street were parking and access problems caused by construction workers parking on the narrow street; the appearance of rodents after construction disturbed a nest in a nearby creek; and on the east side of the street, siltation problems in a backyard, caused by erosion of a nearby pile of excavation spoils during rainy periods.

4.2.3 Adair Street-Hibernia Avenue-Atlanta Avenue

As noted above, the construction alignment, as it diverges from the railroad line, cuts northeasterly through open land behind houses on the east side of Adair Street and the west side of Atlanta Avenue. Consequently, the houses on those sides of the two streets are most directly affected. Hibernia Avenue, which used to run east-west between Adair Street and Atlanta Avenue, has been severed by the open trench. Most of the houses on Hibernia Avenue have been demolished for the right-of-way. Hibernia Avenue will remain closed even after the construction has been finished. One remaining house abuts the construction on two sides. A large pile of excavation spoils adjacent to this property tends to send mud down onto the property in heavy rain. On one occasion mud penetrated the house itself, soiling a carpet. The occupant, an elderly, invalid woman, also said that construction workers had inadvertently torn out several shrubs from her yard. Although, at the urging of a relative, the woman complained to MARTA, she did not seek monetary compensation for the damage.

The rear of a modern condominium complex at 307 Adair Street is directly adjacent to the construction site. Occupants of the condominium are a more affluent group than other residents of this neighborhood. Construction impacts on the condominium complex have generally not been serious, because it is backed by a brick wall which attenuates noise, dust, and siltation produced by construction activity. But units which rise above this wall do not have such protection from dust and noise. Condominium owners who were interviewed were most concerned about the impact of the construction on the value of their property. At the time of Abt's site visit, many of the units in the complex were vacant. However, two other factors bear heavily on property values here: first, the real estate market for condominiums in metropolitan Atlanta is generally somewhat depressed; and second, this particular complex lies on the northern edge of a neighborhood that is

changing from one of primarily lower-middle income homeowners to primarily low-income renters.

Atlanta Avenue, which runs almost parallel to Adair Street to the east of the construction, was formerly the site of houses of low-income black residents. It is now part of Decatur's urban renewal area, and most houses had been removed by the Decatur Housing Authority prior to MARTA construction. Consequently, the area abutting the east side of the construction is now almost entirely uninhabited. One woman, who still resides on Atlanta Avenue by choice, said that she had not been bothered by the nearby construction, perhaps because she is absent from the house during working hours.

4.2.4 Ebster Pool and Playground

The City's Ebster Pool and Ebster Recreation Building are located, respectively, on the west side and east side of the construction alignment, between Atlanta Avenue and the Adair Street condominium complex. Prior to MARTA construction, the pool area was connected to the recreation center building by a playing field, and access to the pool used to be from Atlanta Avenue, via the playing field.

In conjunction with its urban renewal plans for this neighborhood, the Decatur Housing Authority purchased the Ebster pool, playing field, and recreation building from the City of Decatur. The Housing Authority then leased the pool and the recreation building back to the City for one dollar a year, since it was not yet ready to proceed with the urban renewal. The Housing Authority also sold to MARTA the land needed for the rapid transit construction. The Housing Authority expects to proceed with new residential development when the MARTA construction is finished. The plans for the Ebster Park area do not include any low-income housing, according to the manager of the Housing Authority, since the Authority has already built three such projects, with 399 units, in Decatur.

These three projects are Gateway Manor, Allan Wilson Terrace, and Swanton Heights. All three are close to Atlanta Avenue and many of the users of Ebster Pool are children from low-income black families who live in these projects. The excavation for the MARTA subway separated the pool from the recreation building and eliminated access from Atlanta Avenue. A new gravelled road was provided, connecting Ebster Pool with West Trinity Place. Children from the Allan Wilson Terrace and Swanton Heights projects to the east of Atlanta Avenue thus had a longer walk to reach the pool than formerly. Children from Gateway Manor had access at least as good as before, and perhaps better, because of the new road. Nevertheless, the adjacent construction significantly altered the appearance of the pool environs, removed the formerly adjoining playing field, and constituted a physical barrier between Atlanta Avenue and the pool site. (See Figure 13.)

Attendance at the Ebster Pool during the summer of 1976 was considerably below that of the previous summer; the Recreation Department estimated 1975 attendance at 4,500, while the 1976 attendance was 2,599. This decline occurred despite the fact that 1976 had a warmer, drier summer than 1975 and that increased attendance was recorded at the City's other two pools, McKoy and Glenlake. (Increased attendance at these pools in 1976 may in part be explained by the fact that for the first time no entrance fee was charged at these pools; Ebster Pool had always been free.) However, increased usage of these pools was not enough to compensate for the drop in attendance at Ebster Pool, which suggests that children in the Ebster Pool area simply swam somewhat less in 1976 than in 1975. It is, moreover, reasonable that not many children from the Ebster area would walk the considerably longer distance to either of the other pools: Glenlake is located in a more affluent, all-white neighborhood in the northern part of the city, and the McKay Pool is in the extreme southern portion of Decatur, several miles from Ebster Pool. It appears likely that the decline in usage of Ebster Pool was

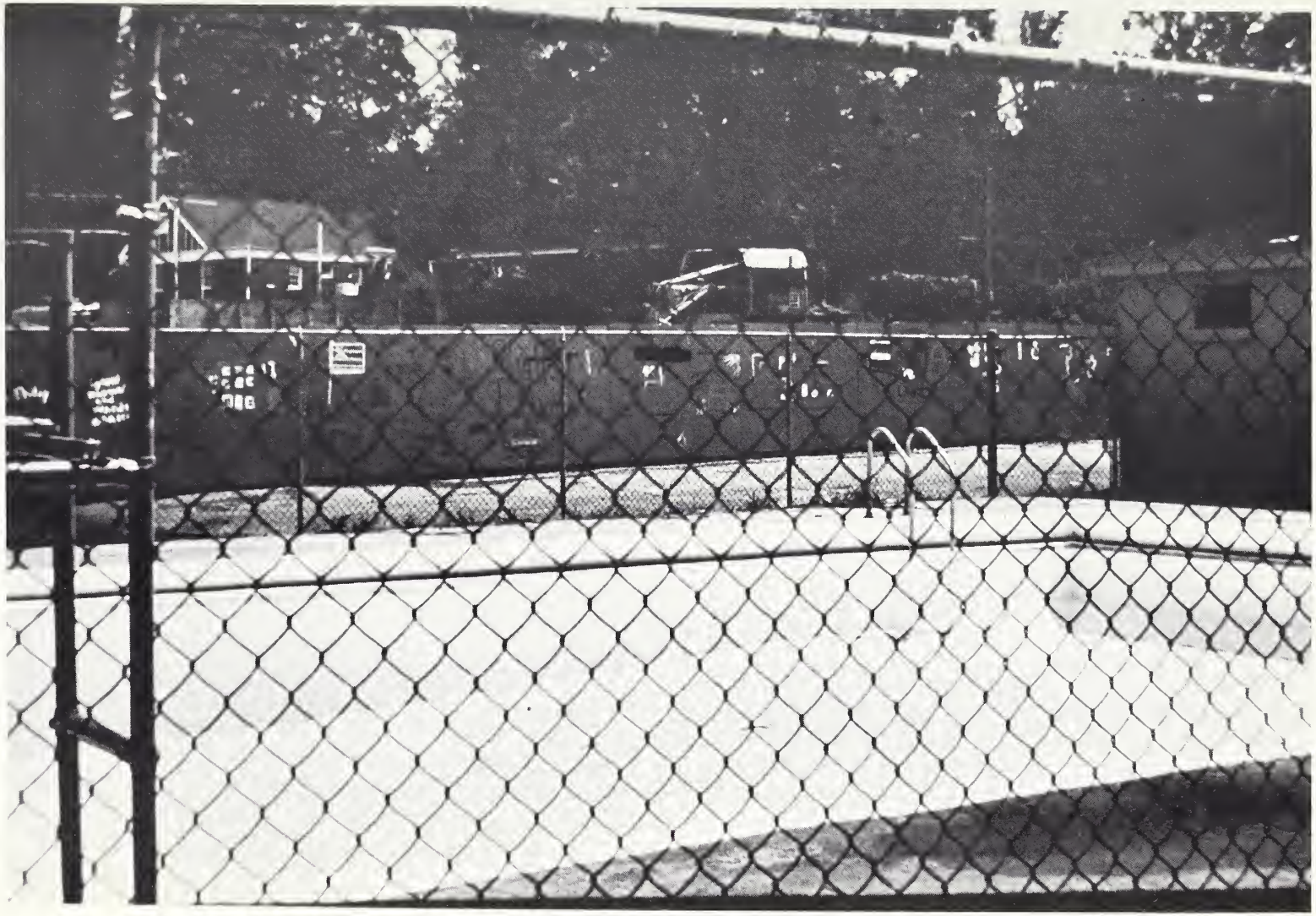

FIGURE 13. EBSTER POOL. Behind the fence, excavation was going on at the time this picture was taken. The houses visible in the distance are on the other side of the right-of-way, and front on Atlanta Avenue.

due in part, at least, to the construction which not only hindered access but was unsightly and also removed the adjacent playing field.

Ebster Pool will soon be closed permanently, according to present plans. The City had originally not planned to operate the pool during 1976, because it needed considerable repairs and there was uncertainty over the impact of the adjacent construction. When neighborhood residents complained, the pool was opened in the summer of 1976, but two weeks later than the other two pools. The playing field that was lost to the MARTA construction will be replaced by a playing field to be constructed at the Beacon School, and the other recreation activities carried on in the Ebster Recreation Building (which will be torn down) will also be transferred to the Beacon School (which has extra classroom space available).

4.2.5 Beacon School

The Beacon School is located on West Trinity Place between Atlanta and Electric Avenues, just adjacent to where the subway alignment crosses over West Trinity Place after emerging from the portal. The Beacon School serves 5th and 6th graders for the entire city; hence, the only alternative for dissatisfied parents is to place their children in private schools. The school has an enrollment of about 150 at present.

School administrators interviewed mentioned the following disruptions that construction activities had caused:

a. In an early stage of construction last spring, the beeping of dump trucks as they backed up was very distracting, as was the constant hammering of pile drivers.

b. Construction activities have increased the volume of traffic on adjacent streets, and the sound of heavy trucks shifting gears is bothersome.

c. Dust is the most constant source of irritation; teachers' cars need more frequent washing, and the school's janitorial service requirements have increased. The building is not

air-conditioned, so windows need to be open, even in winter, with full classrooms. The School Department is considering asking MARTA to pay for installing air-conditioning; an Atlanta school has already made such a request, but MARTA has not yet acted upon it.

d. The administrator also mentioned that the contractor had used a guard dog to prevent theft and vandalism from his nearby facility. The children, of course, were tempted both to play with and annoy the dog. The contractor promised to remove the dog but took a very long time getting around to it. At least one child climbed the fence behind which the dog was kept.

e. One 6th grade teacher was very bothered by the construction noise and wanted to change classrooms, a problem since his classroom is fitted with lab equipment. He ended up not moving after the Resident Engineer came and explained how long the noise would persist and that the situation would improve.

f. As of October, one child was enrolled in the Beacon School only provisionally; the parents will place the child in a private school if they decide the construction noise is interfering with their child's education.

School personnel noted that the Beacon School had lost a playground to MARTA construction, but they did not consider this a serious loss, since the old playground was inadequate and alternate facilities are going to be provided. On the positive side, the MARTA contractor did manage, as requested, to complete pile driving in the vicinity before the reopening of school in the fall of 1976. MARTA staff also demonstrated good will in visiting the school to show a film to students explaining the transit project; they left the film, so it could be shown again to students who had missed it the first time.

4.2.6 Gateway Manor

Gateway Manor is one of three low-income housing projects operated by the Decatur Housing Authority; it is being severely impacted by the MARTA construction and will continue to be impacted by the finished rapid transit line. The line, still on its aerial structure, after

crossing West Trinity Place, passes through a corner of Gateway Manor as it curves toward the east and finally goes underground again beneath Swanton Way.

For its right-of-way, MARTA acquired (and then demolished) two buildings and one wing of another. A total of 24 apartments were removed, 12 of which were occupied by elderly persons. Most of the elderly tenants displaced were relocated in a rehabilitated building which the Decatur Housing Authority leased for the purpose. Two elderly persons were relocated to a home for the elderly run by the Baptist Church. The relocation of the 12 non-elderly households was handled by MARTA according to their standard procedures.

The rapid transit line, on an elevated structure, passes within about 25 feet of one of the buildings in Gateway Manor. A concrete retaining wall, perhaps 20 feet high, separates the railroad from the building (see Figure 14). The wall, of course, is all that can be seen from windows at that side of the building; it may, however, ultimately afford some protection from the noise of passing trains once the system becomes operational.

According to the people we interviewed, the most severe impact of the construction on the residents of Gateway Manor was the noise of pile driving. Pile driving was accomplished during the summer so that nearby Beacon School on West Trinity Place would not have its classes disrupted by noise. On the other hand, the pile driving in mid-summer was a disadvantage from the standpoint of residents who would otherwise have had their windows open. Noise impact was felt not only in Gateway Manor, but also in Allan Wilson Terrace and noise could even be heard at the Decatur Housing Authority office located adjacent to Swanton Heights, about a quarter of a mile from the actual construction. Many of the residents of Gateway Manor and Allan Wilson Terrace are elderly people who were likely to be at home during the day while the pile driving was going on (between 7:00 a.m. and 4:30 p.m.).

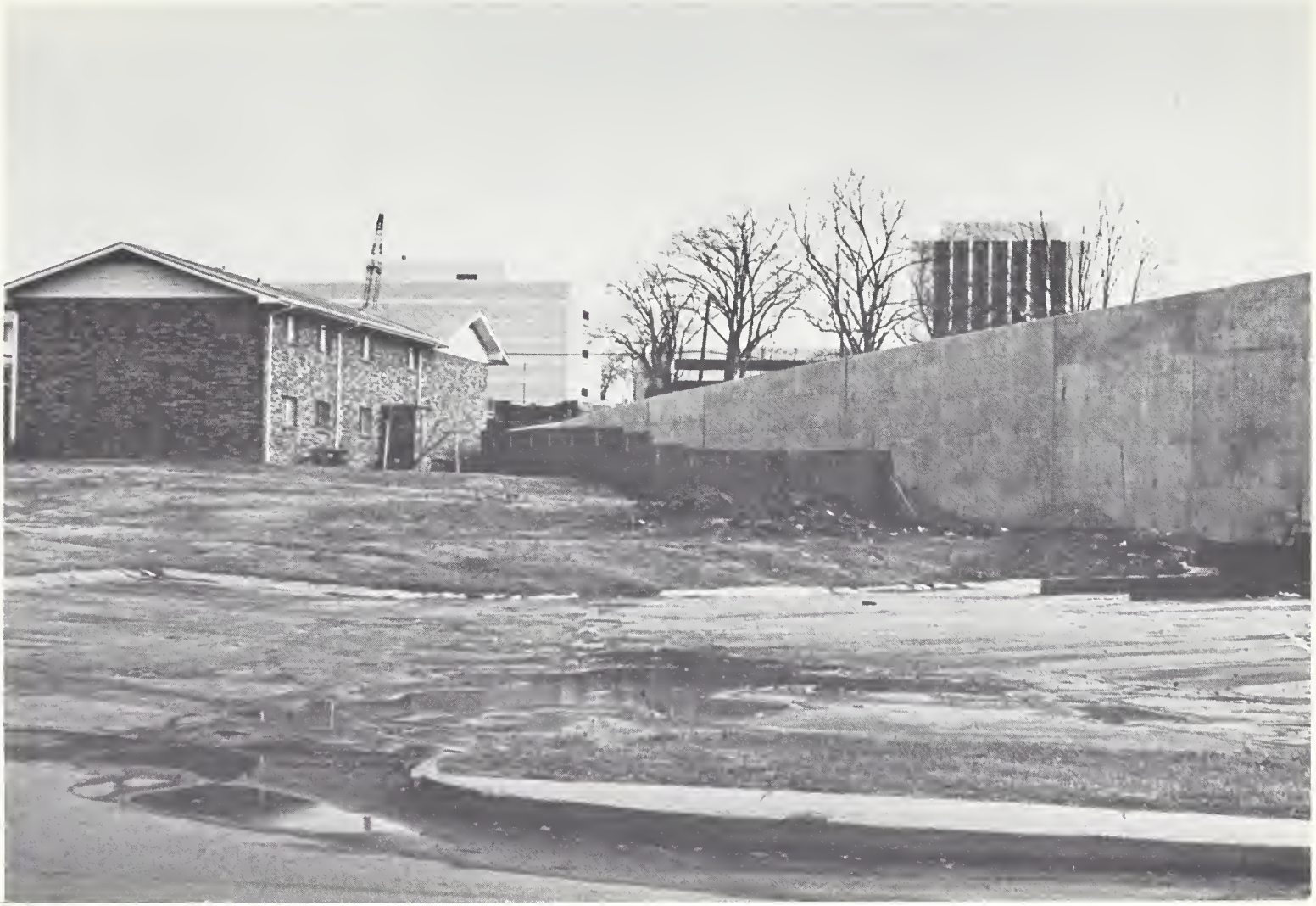

FIGURE 14. RETAINING WALL CLOSE TO ONE GATEWAY MANOR BUILDING. This building formerly had a wing, going to the right, which was purchased (and then demolished) by MARTA. Displaced residents were relocated either by MARTA or the Decatur Housing Authority.

At least four elderly residents of Gateway Manor vacated their homes temporarily to get away from the noise.

A longer term impact on Gateway Manor was disruption of access, when the MARTA construction permanently closed off the more easterly of the two entrances to the housing complex. The remaining, more westerly entrance, is less convenient for the majority of the housing units and, more seriously, is farther away from the center of Decatur. Gateway Manor residents, many of whom do not own cars, have had to pay an additional 50¢ in taxi fare to reach downtown, since the nearer entrance was blocked. The closing also meant a longer walk to downtown stores and bus lines. To shorten taxi or walking trips, residents carved steps into a hill at the rear of the complex in the corner nearest Court Square (see Figure 15). Rain subsequently eroded the earthen steps, making them hazardous for many users, particularly elderly people. Residents' requests that MARTA install permanent steps in the hill were for many weeks bogged down in red tape involving, among other things, a change order for the MARTA contractor. Although attempts to get the wooden stairs installed were begun in July of 1976, it took until December of that year to put the steps in place.

This kind of delay in responding to tenants' complaints damaged relations between MARTA and Decatur's public housing residents. They have been displeased at what they consider a general absence of courtesies which they feel should have been shown them by MARTA and its contractor. Residents point out (and some MARTA personnel agree) that higher-income, white residents (further east along Sycamore Street) appear to have received prompter responses to their complaints.

Another source of annoyance to Gateway Manor residents was the presence of the guard dog in the contractor's facility (already mentioned in connection with the Beacon School). The presence of the dog both offended and frightened the residents and they felt the contractor was very slow in removing it.

FIGURE 15. STEPS CARVED OUT OF CLAY IN BACK OF GATEWAY MANOR TO SOLVE AN ACCESS PROBLEM CREATED BY RAPID TRANSIT CONSTRUCTION.

Gateway Manor residents also mentioned that mud and dust from the construction activity had been troublesome, adding to their housework and forcing them to keep windows closed during hot weather. Some tenants also suspected that the MARTA excavation work had aggravated an existing problem of rats in the area.

4.2.7 The Court Square Area

As the transit line leaves the area of the public housing projects, it reenters the ground as a subway heading east toward the Decatur Station site. As can be seen in Figure 8, the alignment proceeds eastward under Swanton Way and its continuation, Sycamore Street. In Court Square (where Swanton Way and Sycamore Street join), the path of the excavation lies between the new DeKalb County Courthouse to the south, and a modern highrise office bulding and the old County Courthouse to the north. A Confederate monument in front of the old Courthouse had to be moved a short distance closer to the Courthouse to make way for the excavation. The modern office building -- generally called the "glass building" in Decatur -- is owned by Simons-Eastern, a large consulting engineering firm; the offices of the firm are in this building. The glass building also houses ground floor shops and a branch office of the Citizens and Southern Bank. The structure was built quite recently; it originally had a row of ground floor storefronts on its south side, which jutted out beyond the upper stories. This protruding row was lopped off, before any of the stores had ever been occupied, in order to make room for the MARTA right of way. A representative of Simons-Eastern mentioned that the contractor's system for underpinning the remaining edifice underwent several changes before a technique satisfactory to the owner was arrived at. Street closings in the immediate vicinity impaired access to the building and were particularly bothersome as announced closings and traffic reroutings were often not adhered to. The impression given by people interviewed is that such impacts were greatly exacerbated by a woefully inadequate system for

communicating construction-related plans to the people affected. Information regarding the schedule of street closings and traffic reroutings was often insufficient and/or wrong, and sometimes resulted in avoidable adverse impacts such as missed deliveries to building tenants. Simons-Eastern executives said that they repeatedly had to take the initiative in obtaining information on events in the construction schedule affecting their operations.

The Citizens and Southern Bank in the same building also experienced access problems due to the construction: the bank's drive-up window was closed for a time, and the access route to the bank's parking lot (shared with Simons-Eastern) changed several times, confusing and annoying customers. Bank officers attribute a decline in deposit accounts since construction began to these effects of the transit project; they assume, however, that previous patrons have merely switched their accounts to other, more accessible C&S branches in Decatur. Impacts on other occupants of Court Square offices, that is, the old and new County Courthouses, as well as on people who work in the Simons-Eastern building, have been principally the nuisance effects of noise, mud and dust, and access impairment, which are expected to accompany such a large-scale construction project.

There are three restaurants in the Court Square area which have felt impacts of the MARTA construction. One of them, on Ponce de Leon Avenue, is approximately one block from the actual excavation. It features low-priced home style food and is open for breakfast, lunch and dinner. This restaurant has been hurt by the construction. The owner thinks that lunch business is off by 10 to 15 percent and dinner business, by 30 to 40 percent. Some lunch business may have been gained from construction workers, but most of them "brown-bag" it; the gain is not enough to make up for the loss, because shoppers avoid the downtown area during the construction. Dinner trade is off, the owner thinks, because elderly persons (many of whom used to patronize this restaurant) do not like to venture into the vicinity of the construction area at night.

Another restaurant, on East Court Square, is one of a chain of short-order restaurants throughout the South. The restaurant is badly affected by the MARTA construction, because it is located within just a few feet of Sycamore Street. Noise, dust, and the general bustle of the construction activity is reducing business by about 30%, according to the manager.

The third restaurant, a bake shop, also on East Court Square, has profited from the construction. The bake shop used to be located on Sycamore Street, but was forced to move when MARTA acquired all the properties on the north side of Sycamore Street between Court Square and Church Street. The owner took advantage of the forced move to acquire more spacious quarters on East Court Square; this allowed the addition of a sandwich business to the bakery. The result has been increased profits for the enterprise.

4.2.8 Decatur's Central Business District

Immediately east of Court Square, excavation for the Decatur Station extends for an entire block of Sycamore Street, which is an older commercial section constituting the heart of Decatur's central business district. The buildings on the north side of the block were entirely removed for construction of the MARTA station; those on the south side were left intact except for one small building, a realty firm, on the southwest corner of Sycamore and Church Streets. Removal of buildings on the block's north side ties in with the City's urban renewal plan for the block, which calls for development of a pedestrian mall atop the completed transit station. Hence, this block of Sycamore Street will remain permanently closed to all vehicular traffic other than emergency vehicles. City administrators hope that the combined mall and station will be a key to revitalization of Decatur's CBD which, like many other older downtown areas, has been losing business in recent years to outlying suburban shopping centers in DeKalb County. In the

meantime, however, some of the business proprietors along the block point to the gaping hole in front of their stores (see Figure 16) and wonder aloud whether they can survive this revitalization process. This block of Sycamore Street has been excavated the width of the street up to the edge of the sidewalk facing the stores on the street's south side and including also the area formerly occupied by now demolished buildings on the north side. During the summer there was no provision for any east-west vehicular traffic whatever along the length of the block. Once utility relocation work was completed, a single lane for emergency vehicles was installed alongside the sidewalk on the south side of the street. The first such passageway turned out to be too narrow to accomodate firefighting equipment and had subsequently to be widened. When excavation work first began here, a tall wooden fence was placed at the edge of the sidewalk. This protected pedestrians, but also totally masked the storefronts from view. At the merchants' request, MARTA exchanged the wooden fence for a lower, partially chain-link fence; furthermore, the fence was placed not at the edge of the sidewalk but at the edge of the emergency lane, so that it is about 15 feet from the fronts of the stores. (See Figure 17.)

A common complaint heard from Sycamore Street merchants is that parking space for their customers was lost, particularly at the stores' front doors, because of the excavation here. To help these businesses through the construction period (and afterward, when the mall is in place), City administrators constructed a new public parking lot at the rear of the Sycamore Street stores, on the site of a former movie theater. The lot, with its entrance on McDonough Street, runs parallel to the Sycamore Street retail block and affords the majority of the block's establishments direct lot-to-store access via their rear doors. An alley leading from the lot to the Sycamore Street sidewalk also permits pedestrian access to all stores from Sycamore Street. To encourage use of the new lot, the City improved its appearance by commissioning a local architect to paint a colorful mural on a black wall abutting the lot.

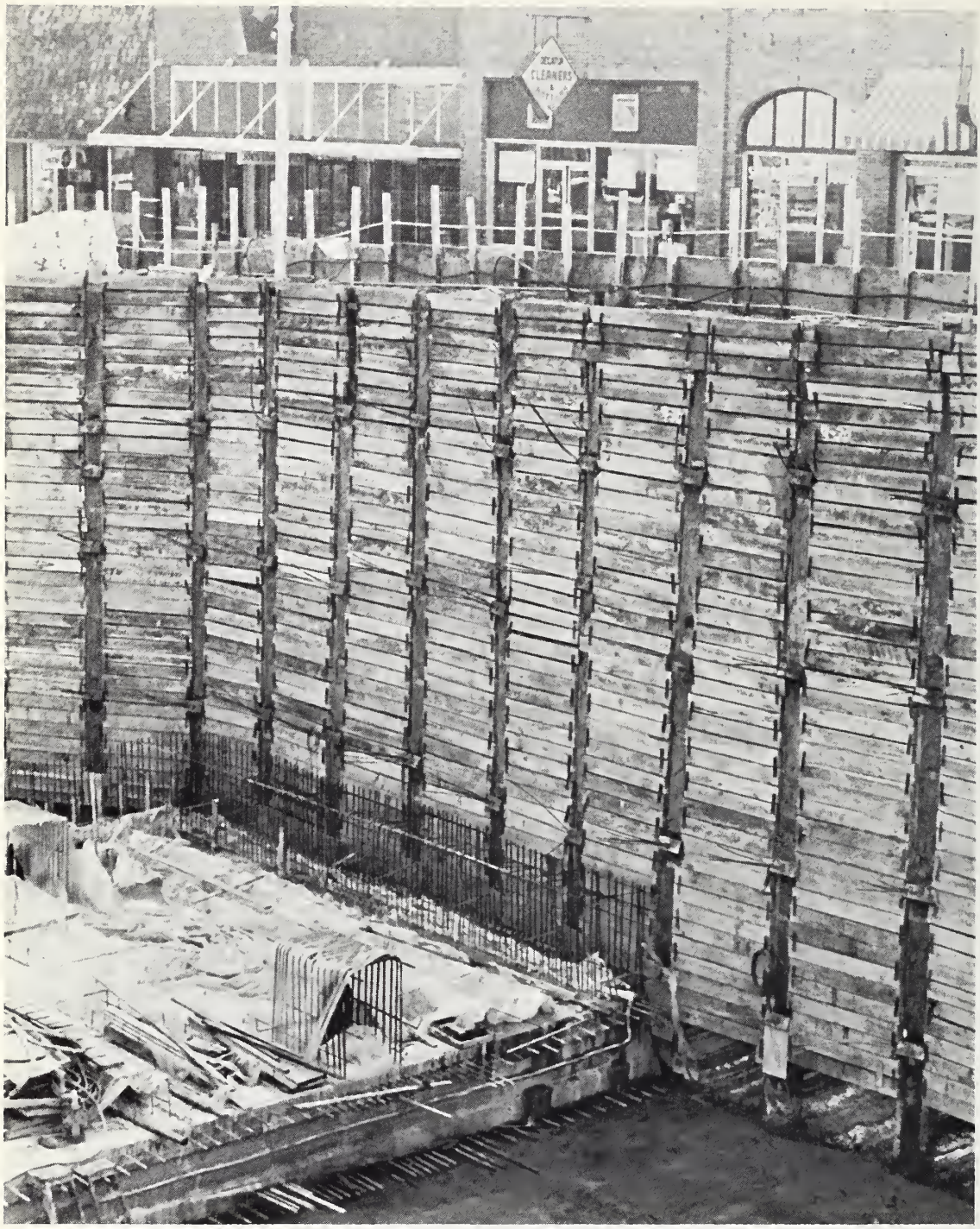

FIGURE 16. EASTERN END OF THE RETAIL BLOCK OF SYCAMORE STREET SHOWING EXCAVATION FOR DECATUR STATION.

FIGURE 17. LOOKING EAST ALONG THE "RETAIL BLOCK" OF SYCAMORE STREET. The picture shows the improved condition in October 1976. Prior to then, the fence had been solid and much closer to the stores (the emergency fire lane had been outside of the fence).

In actuality, the sixteen parking spaces lost on Sycamore Street to MARTA construction have been more than replaced by the twenty-one new spaces provided in the rear lot and in front of the new County Courthouse on McDonough Street, although this alternate parking is slightly less convenient to businesses on Sycamore Street. However, merchants on the retail block have largely been reluctant to open their rear door to customer access from the new parking lot, for fear of shoplifting losses; they say that in a one- or two-employee store it is difficult to watch both a front and rear door.

North-south traffic flow at the west end of the retail block has been maintained, if slowed, via McDonough Street and East Court Square. At the east end of the block traffic on Church Street was interrupted temporarily to permit decking of the Sycamore Street excavation at that point. Scheduled to be closed for six weeks, Church Street remained impassable twice as long as expected on account of unforeseen problems including a workers' strike, late delivery of decking materials, and bad weather. The prolonged closing of this major north-south thoroughfare was the subject of numerous complaints. The owner of a lock and key shop which faced Church Street at the northwest corner of Church and Sycamore Streets relocated his establishment north to Clairemont Avenue in the midst of excavation work on Sycamore Street. He complained that his business was hurt by impaired access to the shop; and the last straw that led him to move was an occasion when his delivery truck had to be towed out of mud at the edge of the excavation next to the shop.

Many of the retail establishments in central Decatur are small and unable to compete effectively with shopping centers on the basis of volume, variety or price. Just prior to the start of MARTA construction in downtown Decatur, the City's one department store, a member of a regional chain, closed its Sycamore Street store permanently. This store had been considered an "anchor" for the block, drawing business for the other, smaller shops nearby. It might be argued that some of the older retail stores in downtown Decatur have managed to survive the last

decade in part because rents have remained low and because they are one- or two-person enterprises from which the proprietor merely draws a salary.

Simultaneously with its decline as a retail center, Decatur's downtown has been evolving into a banking, legal and governmental office center. Several of the City's banks, enjoying the benefits of growth in surrounding DeKalb County, have built large offices in Decatur. The County government (of which Decatur is the seat) has rapidly expanded its operations and facilities apace with County population growth. In addition, some large business and law firms have moved their offices from downtown Atlanta to Decatur in order to be nearer their employees' suburban residences, in a setting which is convenient to Atlanta and its airport, yet offers small-town amenities absent in downtown Atlanta. Workers in these new Decatur offices constitute a growing proportion of the clientele of downtown Decatur's remaining retail businesses. These customers typically live outside Decatur proper but lunch and shop in Decatur at noontime. Construction disruption in downtown Decatur has to some extent accelerated this trend. Nearly all of the Sycamore Street retailers complain that construction impacts have hurt their trade; but those in a position to draw upon "captive" downtown office workers to replace other patronage that fell off with the advent of construction have better weathered the disruption period than those establishments which compete with shopping centers and are more dependent on Decatur housewives as principal customers. A jewelry/watch repair shop and a card shop, for example, have felt only slight impact on their business during the construction as they have successfully attracted office workers as customers. Neither of these shops depends heavily on the availability of nearby on-street parking. The business volume of other establishments such as a green grocer, a meat market, dress shop and record store, has slumped much more seriously since construction began, since these stores carry merchandise that is obtainable elsewhere at lower prices, and the food markets are more dependent on convenient vehicular access for deliveries and transport of purchases.

All of the retail establishments on the south side of Sycamore Street have been inconvenienced by the construction work going on at their front doors, which has impaired vehicular and pedestrian access and generated bothersome dust, mud and noise. Impacts as experienced by specific business establishments are described in the following pages. In general, construction impacts on this retail block have tended to fall as follows:

a. Impaired access, both vehicular and pedestrian, from street closings and altered sidewalk passage has been the most significant negative impact of MARTA construction. The result has been a general decline in business activity and, as would be expected, the stores most seriously hurt have been those which depend heavily on curbside access for parcel pickup.

b. Those establishments which offer specialized merchandise not readily obtainable at shopping centers have fared better during the disruption than stores selling goods also found at competing shopping center outlets.

c. Similarly, stores with established, loyal patrons have been less adversely affected by construction impacts than have stores that are more oriented toward impulse shoppers.

d. Particularly hard hit have been food stores, because of the highly competitive nature of their business and customers' reliance on vehicular access for transporting purchases. Also, dust penetration into stores is perhaps a greater problem for stores selling edible merchandise.

e. Dust, mud and noise associated with construction, as well as access problems, appear to have deterred shoppers from patronizing Sycamore Street businesses.

f. Important secondary impacts of business losses during construction have been layoffs or reduced working hours for a few employees of retail stores on Sycamore Street.

The following narrative describes specific impacts that MARTA construction has had on individual businesses in downtown Decatur as of October 1976 (that is, approximately during the first four months of the construction activity). Figure 18 shows the location of businesses along the retail block of Sycamore Street fronting the station excavation.

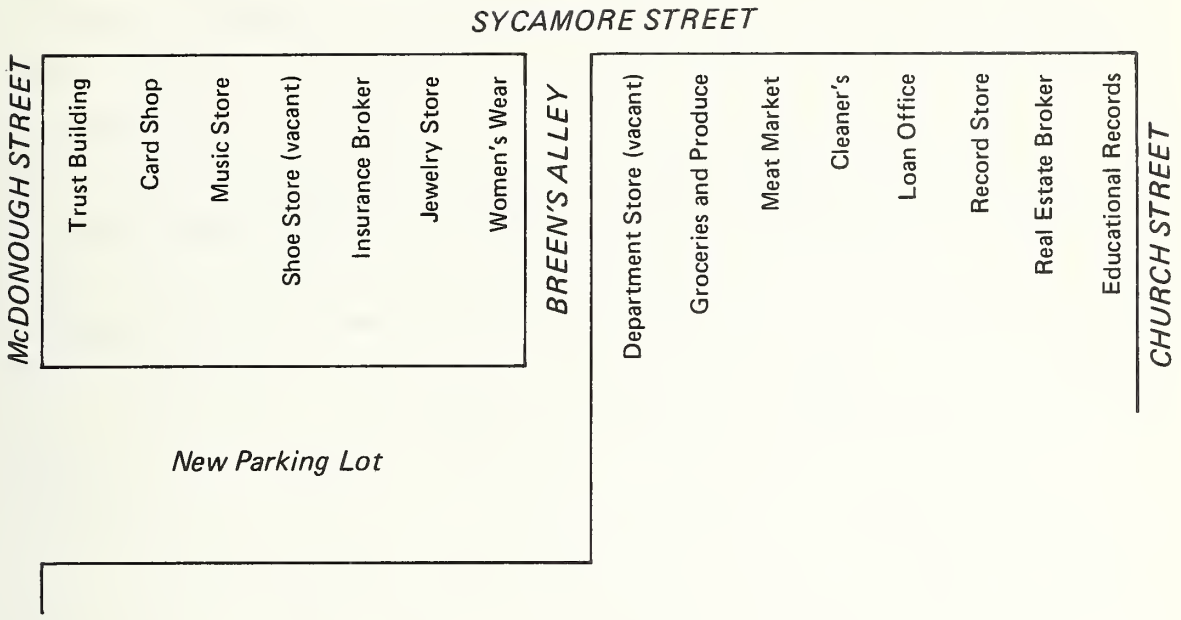

FIGURE 18. LOCATION OF BUSINESSES ALONG RETAIL BLOCK OF SYCAMORE STREET

Card Shop on the Square. A small shop is located near the west end of Sycamore Street. It sells greeting cards, small gift items and stationery. According to the proprietor, sales have slipped by about 20% since construction began. The store is fortunate to have substantial patronage among nearby office workers. The owner believes that the completed project will have a very positive impact on his business.

Music Store. The owner is a merchant in his 60's, who is near to retirement and who had intended to use the profits from his last few years in business as a retirement nest egg. His small, narrow store, primarily sells sheet music and records. His record prices are significantly higher (and his selection is more limited) than at large record shops in shopping centers. It is not surprising then, that he

has been particularly hard hit by the construction impact. The owner said that he expected to do between 30% and 40% less business in 1976 than in 1975.

As a result, the owner has laid off his former store manager and reduced clerks' working hours. He said that the major cause of his sales losses was difficult access to the store resulting from street closures and traffic reroutings, and secondarily, the decline in patronage of the block as a whole due to MARTA takings across the street, bankruptcies and voluntary moves, such as that of the department store that used to be located in the middle of the block.

Shoe Store. The closing of this forty-two year old establishment was announced in a front-page article in the Atlanta Journal of August 25, 1976. According to the news report, business was down about 35% at the time, a decline which the owner blamed on access problems caused by MARTA construction. He also operates two branch stores in suburban locations. Recognizing that construction along Sycamore Street was likely to hurt his business for a two-year period, the owner decided to vacate that site and consolidate operations at the other two stores. He expected to lose little business by the move. An important factor in his decision was his renter status at the Sycamore Street location. He had no financial stake in the building, and furthermore, anticipated a rent increase once MARTA construction was completed.

Jewelry Store. This is an old retail business owned and operated by its proprietor who is assisted by a watch repairman and two sales clerks. The original shop site on the north side of Sycamore Street was razed for MARTA construction. The owner chose to relocate to the south side of the block largely because he owns the building he moved into and might have had difficulty finding a tenant for it during the construction period. His sales volume did drop somewhat when construction began, the most serious impact occurring with the closure of Church Street, he said. Losses were not as severe as they might have been,

however, due to the continued patronage of office workers in the vicinity, who walk to his shop. In fact, the store had an excellent Christmas season, doing more business in December of 1976 than during the previous December.

The owner noted that intrusion of dust from the construction site has added to the time his employees have to spend cleaning the shop. He is only guardedly optimistic about the long-term benefits to his business of the finished pedestrian mall and transit station.

Women's Wear. The owner of the store was sufficiently concerned about anticipated construction impacts (and the impacts on his store from the station and the pedestrian mall) that he tried to stop the project from going forward by bringing suit in Superior Court against MARTA, the City of Decatur, and DeKalb County. The trial court held for him, but on appeal, the project was permitted to proceed, although the City of Decatur had to maintain vehicular access for the store and the owner was told that he could sue for damages if any resulted from the mud, dirt and dust of the construction.

As far as his business is concerned, the owner told us that he had to reduce his mark-up in order to try to maintain volume of sales. Neighboring merchants also noted that the store seemed to be having one sale after another -- evidently another attempt to lure customers into the store.

Department Store. This store, as we have noted, is empty. The chain that owns it operates department stores in several shopping centers in the area and this old-fashioned store did not fit into their current plans.

Groceries and Produce. In business at its Sycamore Street location since 1931, this store specializes in fancy fruits and vegetables, and also sells canned goods and other items commonly sold in a neighborhood grocery store. The store's profits, which have been declining in

recent years, were dealt a serious blow, according to the proprietor, by MARTA disruption to Sycamore Street. Sales have been declining overall, but particularly among the high-profit fancy fruit which formerly attracted impulse shoppers when it was displayed on the sidewalk. Construction dust has made outdoor display impossible, and now lower-profit items constitute a greater proportion of total sales. The owner mentioned that even if his business survives the construction period, he expects to have difficulty renewing his store lease at an affordable rent. Whereas since 1931 the store's lease has been renewed every ten years, recently it was extended only three years, to be renewed soon after completion of the MARTA station. The owner expects that the landlord will at that time raise the rent considerably to reflect the higher value of the property.

The proprietor backed up his contention that his business had suffered greatly by showing us records of his gross sales as recorded by his accounting service. Calling his January 1975 receipts 100, the books showed the following sales figures:

TABLE 5. GROCERY STORE RECEIPTS, 1975-76

Month	1975	1976
January	100	85
February	91	78
March	96	78
April	95	79
May	111	78
June	103	77
July	102	77
August	99	60
September	93	60
October	96	
November	95	
December	116	

Meat Market. A specialty butcher shop is located in the grocery market and has been in business twenty-nine years. The store has a reputation for high quality meats and prior to MARTA construction enjoyed a brisk business. Current business volume is down 36%, which the owner attributes to customers' confusion over MARTA-related traffic pattern and parking changes. Close parking space for customers is important to his business and that of the neighboring fresh produce store since the merchandise consists mainly of bulky, perishable items. The proprietor of the meat market surveyed his customers one week and found that the majority came by automobile from between ten and twenty-five miles away. As an inducement to continued patronage during the construction period, the butcher compensated customers for their parking fees in the lot at the rear of the store. Until his landlord agreed to provide customer parking free of charge, he was reimbusing parking fees to a total of approximately $500 per month, at an average rate of $.25 per car. MARTA had to refuse the butcher's request to pay a portion of the costs as the Authority is not legally permitted to do so.

Loan Office. We did not have an opportunity to interview anybody at this establishment, a pawn shop. However, the real estate broker and appraiser two doors down, told us that the store had been vacant for a long period of time. The space used to rent for 60% more than the rent currently being charged. The real estate broker ascribed both the extended vacancy and the lower rent to the undesirability of the space during MARTA construction.

Record Store. This store, in business at its Sycamore Street location for sixteen years, is a one-man operation. The shop stocks specialized records which are not readily available elsewhere. Its sales began to decline immediately following the closing of Sycamore Street and have continued to drop. The major problem appears to be access. Customers occasionally call to say they have canceled a planned visit because of this difficulty. For the year, a business decline of about 35%, similar to the Music Store, is anticipated.

Real Estate Agency. We talked with a real estate broker who is also an appraiser. He has testified several times in behalf of property owners who hired him in law suits against MARTA in order to obtain higher compensation either for land that was being taken or for easements that MARTA required. He is also the leasing agent for several stores along this block. He sees considerable impact from the construction, reflected in longer vacancies and lowered rents, at least for the duration of the construction. Frequently, according to the broker, prospective tenants who might otherwise have been interested in leasing space in this block were dissuaded by the construction disruption.

Nevertheless, the broker himself had sufficient faith in the ultimate economic health of the block to have remained in it. His office used to be in a building at the corner of Church Street, which was taken for the MARTA construction. He thereupon moved to his present location in a building which he owns.

Educational Record Center. This is basically a mail order operation and not dependent on pedestrian traffic or vehicular access. This space had been vacant for four to five months before the present tenant moved in, according to the real estate broker next door. The present tenant is paying about 20% less than the previous one -- a direct construction impact according to the broker.

4.2.9 Supermarkets

Two supermarkets in downtown Decatur appear to be affected quite differently by the MARTA construction. Each is about two blocks from the actual excavation.

National Food Chain Market. A large supermarket is located on Church Street, north of Ponce de Leon Avenue. It is part of a large national chain with numerous locations throughout the metropolitan area.

The clientele of this store consists predominantly of black persons who live in the southern portion of town. They had difficulty

in getting to the store when Church Street was closed and remained closed for much longer than had been anticipated. Often, these former patrons would shop at another supermarket rather than face a difficult detour to this market. Significant loss of business began shortly after the closing of Church Street and the beginning of major excavation work on Sycamore Street. According to the manager, the decline per week averaged about 30%. He attributed part of the loss to the general reduction in shoppers in downtown Decatur, caused largely by the construction disruption. It should be noted that when Church Street was reopened, business picked up again and the store had an excellent December.

Regional Food Chain Store. According to the manager of this store, business was off somewhat because of the construction, but not terribly so. This store is about two blocks north of the construction on Sycamore Street and only two blocks from the national market. Its clientele consists mainly of whites who live in the northern part of town and do not have to cope with the construction activity in reaching the store.

4.2.10 The "Institutional" Block of Sycamore Street and Church Street

As the transit line leaves the commercial block of Sycamore Street it next passes under a block from Church Street to Candler Street which can best be described as institutional in character. The block includes a church, an office building, the main branch of the DeKalb County library, and the main building of the Decatur Recreation Department.

The block of Church Street from Sycamore Street to Trinity Place is similarly institutional in character. A neighborhood health center is located midway in the block and a high rise apartment building for the elderly stands at the Trinity Place intersection.

Because the area is heavily institutional in character and contains institutions which serve both the City of Decatur and DeKalb County, the impairment of access has had a widespread impact both for the general public and especially for certain special populations. Among the latter are the transit-dependent persons who relied upon the North/South DeKalb bus on Church Street for transportation to the free neighborhood clinic or to the County library. The closure of Church Street necessitated rerouting the bus line several blocks to the west. This rerouting imposed particular burdens upon the elderly, who found the added walk difficult. The closure of Church and Sycamore Streets also made auto access to this institutional area more difficult.

The impact of street closures and related access problems is evident in such data as the visitation rates at the health clinic and the library, the attendance figures at the Recreation Center, and the rates of trip making by the residents of the high rise apartment building for the elderly, Philips Presbyterian Towers.

Decatur Health Center. This is a County-run public health clinic, which primarily serves Decatur's low income and elderly population. Prior to the MARTA construction activity, many of the clinic's clients used the crosstown bus on Church Street for access. With the closure of the street and the rerouting of the bus, attendance at certain of the Center's clinics has dropped. Attendance at the elderly drop-in clinic has suffered the most, with attendance down some 50%. The next most severe impact has been felt by the child clinic, where attendance fell 15-20%. Many of the clinic's low income clients have been required to take taxis instead of the bus to arrive at appointments, which has placed a financial burden on this group.

The clinics at the health center do not record visitation figures for walk-in traffic. Consequently, the percentages given are the best estimates available. (Information was supplied by the Director of the Decatur Health Center.)

Decatur-DeKalb Library. The library on Sycamore Street serves the entire City of Decatur. It is run by the County and is also the main library for the entire County system. Its users, therefore, come from all of DeKalb County.

In the late summer and early fall of 1976, visits to the library began to fall off and so did the number of books checked out. All of this occurred even before heavy construction on Sycamore had actually started, although Church Street was already closed because of the excavation at the intersection with Sycamore Street. Though Sycamore Street in front of the library was physically still more or less intact, traffic was not permitted on it and no access could be had to the library from there.

The figures on visits to the library and books check are as follows:

TABLE 6. LIBRARY USE, 1975-76

	1975		1976	
Month	Visitors (estimated on basis of spot checks)	Books checked out	Visitors (estimated on basis of spot checks)	Books checked out
January	8,324	23,641	8,166	23,292
February	7,186	20,052	7,480	21,099
March	7,533	21,060	7,694	21,413
April	7,751	20,631	7,093	19,899
May	6,888	19,657	6,404	18,063
June	7,398	21,173	7,657	21,830
July	8,154	23,244	7,575	21,533
August	7,038	19,299	6,789	19,921
September	7,151	20,061	6,273	17,748
October	7,564	21,284		
November	6,594	18,377		
December	5,435	14,904		

Decatur Recreation Department. The main impact on the Recreation Department's main building on Sycamore Street has come from impaired access. Since Sycamore Street has been closed to traffic, the only vehicular access is through the rear; this involves a fairly circuitous drive past the fire house and through two parking lots. The center's parking lot across the street on Sycamore Street was taken by MARTA. Attendance at the center has been reduced, particularly on the part of elderly persons who used to attend craft courses offered here.

Tower Apartments for the Elderly. This is a contemporary structure with 225 units, housing 243 residents. Only 70 of these own an automobile. The rest must rely on buses, taxis, and walking if they want to take trips. The rerouting of the crosstown North/South DeKalb bus during the closure of Church Street was, therefore, a serious impact on these senior citizens. The crosstown bus formerly stopped less than half a block from the housing complex, but during the Church Street closing was rerouted several blocks away. The line provides access to two shopping centers at either end of the county and to the DeKalb General Hospital. It should be noted that elderly persons often prefer shopping centers to downtown shops, because there are fewer barriers, such as curbs, traffic, or stairs. Shopping in downtown Decatur, on the other hand, confronts the elderly (and others) with muddy and slippery sidewalks, wooden overpasses over very deep holes, and all the confusion of heavy construction. The manager of the Philips Towers estimated that trip making by the residents declined 40-50% because of the MARTA construction.

Office Building. A modern office building, at the northwest corner of Sycamore and Candler Streets, opened in 1973 as a medical building. It has since been converted to general office use. Ever since the building opened, it has been difficult to achieve a good rate of occupancy. Since the beginning of MARTA construction, the building has had even more severe problems in attracting tenants.

The building's management blames much of the rental problem on the disruptive effects of the transit construction, particularly poor access, dust and noise. Others, however, have blamed the low occupancy rate on the fact that there is an excess of office space in Decatur and that the building's rental charges are too high.

4.2.11 Sycamore Street from Candler Street East

This residential portion of Sycamore Street is characterized by large Victorian houses with ample lawns, wide porches, and large shade trees. The houses are among the oldest in the metropolitan area and some have particular historical and architectural significance. In recent years many young professional families have moved into the area and restored the older homes. It is not surprising that this group was particularly vocal in its opposition to the rerouting of the rapid transit line down Sycamore Street and away from the Georgia Railroad's right of way as originally planned.

The initial opposition to the route change and subsequent opposition to MARTA actions such as property takings, payments for easement, and construction practices was spearheaded by a neighborhood association of Sycamore Street residents known as "SOS" or "Save Old Sycamore." Members of this ad hoc group displayed bright red and white banners on the front porches of their homes with the SOS insignia.

While the organization was unsuccessful in effecting the initial goal of an alignment rerouting to the original railroad corridor, it did achieve other objectives. These included the saving and relocating of two historic houses which were scheduled for demolition because they stood within the alignment right of way. Other accomplishments included a decision to auger rather than drive pilings along the residential portion of Sycamore Street. This change in plans, recommended by the resident engineer, imposed an additional cost on the project of approximately $40,000. Another change in plans which was in part effected

by the activism of this group, was the relocation of telephone and electrical utilities from above ground to subsurface while the street was being torn up. The additional costs for this change were borne by the project rather than the utilities.

The successes of the Sycamore Street neighborhood are also due in large measure to the sensitivity of both the Resident Engineer and the local contractor. Both made a concerted effort to undertake "outreach" work in the community, frequently visiting residents and making their offices open and accessible to the impacted public. During August 1976, for example, the local contractor distributed an informational letter to the residents which explained both on-going and future construction activities. It was signed by the Project Manager, gave his phone number and encouraged residents to call for additional information. During the course of the site visits, the Abt field team learned that while residents of Sycamore Street may have had complaints concerning the project, nearly all were pleased with the openness and accessibility of both the local Resident Engineer and the contractor's project manager.

The impacts on residents were all the ones one would expect: restricted impact, noise, dust, mud. In addition, because Sycamore Street is very narrow, the construction required easements on the front of many properties for utility relocation and similar work. Many front lawns were torn up several times. Houses on the north side of the street are now shielded from the actual excavation by a tall plywood fence. This affords some protection from dust and mud and is a safety factor; it may even reduce the noise impacts somewhat. However, the fence is also quite ugly and gives the houses on the north side a hemmed-in feeling. (See Figure 19.)

Sycamore Street, though primarily composed of single family residences, contains a complex of condominium townhouses on the south side of the block that extends from Columbia Drive to Hillyer Street. In

FIGURE 19. LOOKING EAST ALONG THE RESIDENTIAL PORTION OF SYCAMORE STREET. The wooden fence in front of the houses on the left is located where the front lawns used to be.

August 1976, as part of the MARTA construction, a large utility pole (carrying a 20,00 volt line) was erected at the southeast corner of Sycamore Street and Columbia Drive; the pole was only about five feet from the nearest condominium, since these townhouses stand very close to the street. After complaining strenuously to MARTA, the condominium owners succeeded in having the pole removed in about a week's time. The speed with which action was taken here contrasts sharply with the delays encountered by residents of Gateway Manor to have MARTA install stairs for their benefit.

Of all the residences on Sycamore Street, the most severely affected house is probably Number 627. This is a large, recently restored, bright yellow Victorian house, on the south side of the street. Houses farther east have been bought by MARTA and removed, since the transit line emerges from its tunnel in front of Number 627 and then, in an open trench, curves slightly to the south to rejoin the right-of-way of the Georgia Railroad.

The owner of the house is a young married man with two children; he purchased his home in 1971, unaware, he says, of the fact that the subway route would significantly impact on his property. As it turns out, the concrete portal from which the subway will emerge as it travels outbound from Decatur Station to Avondale Station is only a short distance from the property line of Number 627. (See Figure 20.) In addition, MARTA secured a 7,500 sq. ft. easement on the property's front yard. Several large trenches were dug on the front lawn for utility relocation. It was also necessary to remove a number of large shade trees within the easement to facilitate the excavation activity.

Because of the magnitude of the disruption occurring in front of his house, the owner has contested the financial compensation offered by MARTA in court. To support his claim that a larger award is justified, he prepared a list of disruptive impacts. The major ones can be summarized as follows:

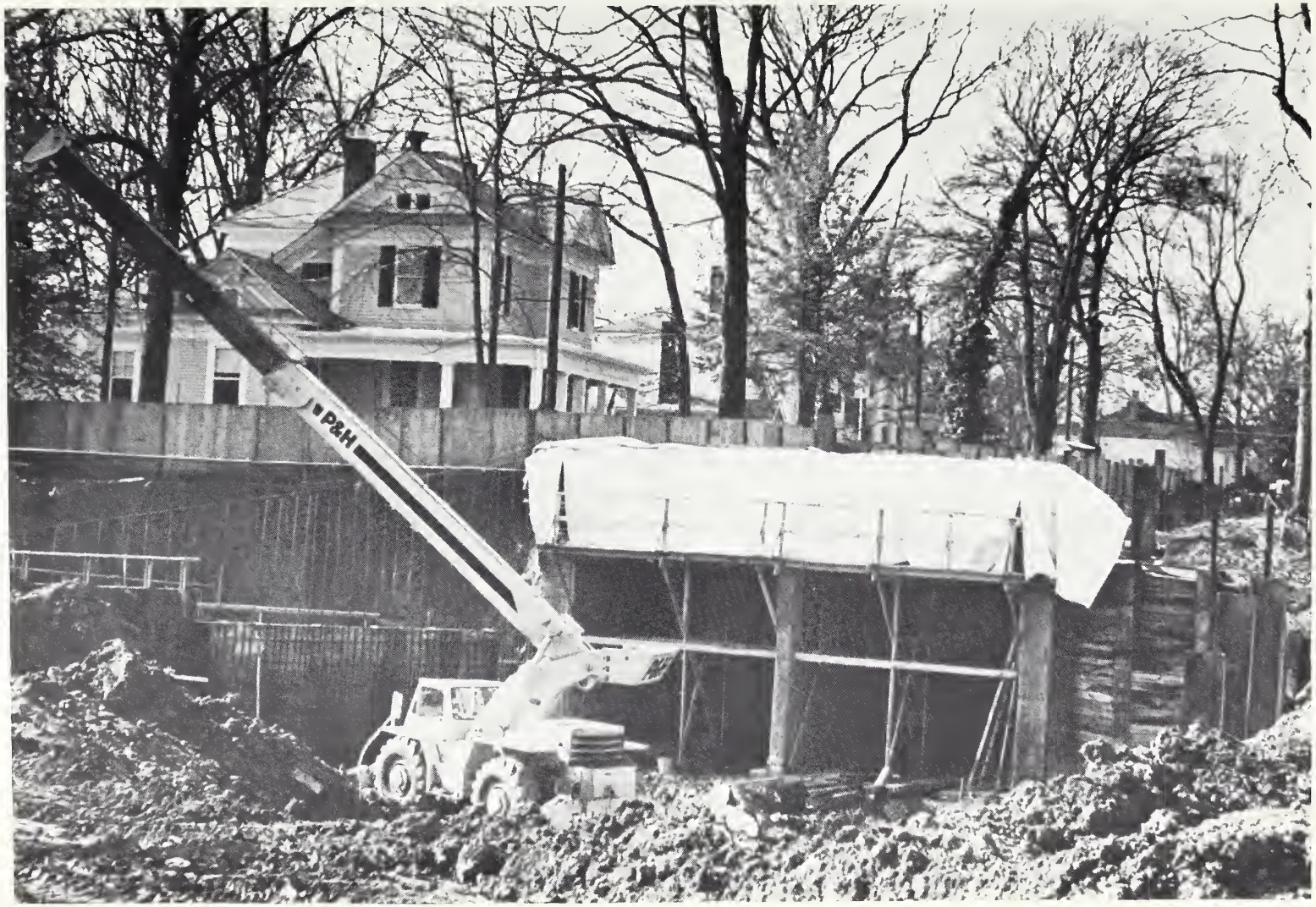

FIGURE 20. SUBWAY PORTAL AT EASTERN END OF SYCAMORE STREET LOOKING WEST. The house on the left is number 627.

a. Property value is likely to go down. Lending institutions are reluctant to lend money.

b. Attractiveness of house down. Loss of trees also requires greater use of airconditioning than before.

c. Dust settles on house, cars, and pool.

d. Utility disruption resulted in inconvenience and in food spoilage.

e. Noise makes sleeping difficult (owner often has to sleep during the day after travelling all night).

f. Mental stress and anxiety, about the security of the property and the safety of the children.

The owner complained that he had difficulty in obtaining clear and accurate information from MARTA. Initially, he maintains, he was given vague and incorrect information concerning the actual routing of the line and the nature of the anticipated impacts. He doubts that if he had been given proper and timely information from MARTA that he would have purchased the house.

Nearly a year elapsed, the owner noted, between the MARTA public meeting which presented routing alternatives and the meeting that dealt with easements and takings and to which he was formally invited. In his view, this last meeting created an adversary relationship between MARTA and the neighborhood. If neighbors had been approached earlier by MARTA representatives and in small, informal meetings, the large meeting concerning property takings would have been far less threatening to residents. MARTA's poor job in this respect compared especially unfavorably, in the owner's view, with the excellent job of communication being done both by the resident engineer and the general contractor.

There are two houses in this otherwise residential area that contain commercial operations. Apparently they constitute nonconforming uses that predate the present residential zoning. One of them is a kindergarten. It has been in this location (the northeast corner of Sycamore and Candler Streets) since 1949. There are three classes, of

15 children each. This year, one of the classes is not filled, something that has never occurred before. The owner and operator ascribes this to the difficulty that parents have in dropping off their children, because Sycamore Street is not usable and North Candler Street is one way, going north. Fortunately, there is access through church property at the rear (by permission of the church), otherwise things would be worse. The owner estimated that enrollment was down 25-33%.

The front lawn had been dug up numerous times and the owner of the kindergarten was concerned about the safety of children and parents, when holes were dug close to the path to the front door. (See Figure 21.) However, the owner also noted that the resident engineer had been considerate and had seen to it that a large hole near the front steps had been covered up.

As for impact on the children, the teachers thought that they were louder than usual. In part this is so because teachers have to talk louder on account of the construction noise. This makes it difficult to achieve one of the major goals of kindergarten teachers: to teach children not to yell, but to talk and to talk one at a time.

The other commercial use is a nursing home on the north side of Sycamore Street, at Number 624, near the portal, and diagonally across from the residence we discussed earlier.

The same family has been operating the nursing home at this location since 1940 and also owns the homes to either side of the nursing home. Although occupancy is not down, business has suffered in the sense that prior to MARTA construction the home always had a waiting list, but now no longer does. According to the nursing home's owner, potential clients are fearful of the construction-engendered truck traffic in the immediate vicinity; both vehicular and pedestrian access are difficult now, and the sight of the construction in front of the home scares people. MARTA has left one lane of the street open in front of the home, so that the driveway is accessible, but only from

FIGURE 21. CONSTRUCTION DISRUPTION IN FRONT OF KINDERGARTEN ON SYCAMORE STREET

the east; on one occasion ambulance operators had considerable difficulty transferring a resident of the home into the vehicle. The sidewalk in front of the home has been replaced with an uneven, granular surface which does not provide solid footing for infirm people and appears to be unusable for wheelchairs.

Other specific complaints were that the driveway had been blocked several times, the noise from construction equipment was very bothersome, equipment was sometimes placed in the yard or driveway, telephone and power service had been cut off for about half a day once or twice, and visiting doctors had complained about tar and mud on their cars. The spacious screened porch on the front of the house is probably unusable when construction equipment is operating across the street. As noted above vehicular access is possible only from the east, so that vehicles coming from the center of town must go considerably out of the way to reach the home.

The owner feels that he has received "inconsiderate treatment" from MARTA. When he registers complaints, the situation improves for a short while and then reverts to what it was previously. At least this is how it worked until he contacted MARTA's General Manager regarding the dirt and mud in the street. However, despite these difficulties, the owners do not plan to relocate the nursing home.

At this point, the rapid transit line emerges from the tunnel, and curving slightly south, proceeds in a trench to rejoin the Georgia Railroad right of way. A few hundred feet farther east, it reaches Avondale Station, the end of the line. Construction is proceeding rapidly along this segment. We did not investigate disruptions here, since the contruction is taking place on land owned by MARTA. Almost all of the disruptions here took place in the past: MARTA purchased a great many properties, for the rapid transit right of way, for the Avondale Station, and for two large parking lots near the station, so that commuters from outlying DeKalb County commuters can be persuaded, it is hoped, to "park 'n' ride."

5. RETROSPECTIVE FORECASTING OF IMPACTS

5.1 INTRODUCTION

This section considers one of the most important ultimate goals of the study of the disruptive effects of urban tunnel construction: development of methods by which disruptive effects might be forecast and thus be avoided by the implementation of appropriate mitigation strategies. The assessment methodology developed in Phase I of the study and applied in the case study of Decatur focused on the identification of impacts (retrospectively, i.e., after they happened) and was thus an impact assessment methodology, rather than an impact forecasting methodology.

Forecasting, by its nature, must take place prior to the event being forecast and must enable planners to identify likely areas and types of impacts before they occur. "Retrospective forecasting of impacts" is concerned with finding an answer to the following question: having conducted an assessment of impacts, what can we learn from the observed impacts that would have enabled us to predict these impacts prior to the actual construction? (A closely related but different question, which will be taken up in Section 6, asks how those impacts which could have been predicted could have been prevented or mitigated.) This section will be concerned with discovering practical methods, which realistically might be applicable, rather than an elaborate theoretical structure, requiring extensive and detailed baseline data. In a world of unlimited time and resources, the theoretical approach would be desirable, but the environment of the transportation planner with its constant time and financial pressures requires an approach that is relatively straightforward.

In Section 5.2 we shall consider several of the impacts observed in Decatur, always asking how these impacts might have been foreseen and how they were affected -- positively or negatively -- by the course of

construction events. Then, in Section 5.3, we shall present a general "prediction logic," namely, a summary of methods that might be used by planners, as tools during the planning process, to help identify potential disruptive impacts.

It should be pointed out that the crucial alignment decision in Decatur -- not to follow the railroad right of way, but to go through the downtown section -- was based on a prediction of impact. That is, downtown merchants and city officials determined that the subway station downtown would help "revitalize" Decatur; it was this prediction that led to the actual alignment used. Thus, forecasting of impacts (in this case, of course, a desired positive impact) has been central to the planning process used in Decatur and, indeed, is important in most other transportation planning contexts as well.

5.2 OBSERVED IMPACTS AND THEIR "PREDICTABILITY"

5.2.1 Ebster Pool

The Ebster pool is located west of Atlanta Avenue and also immediately west of the alignment. The pool serves primarily low-income black children who live to the east of Atlanta Avenue. Thus, the MARTA construction placed a barrier between the pool and its primary users. Although there was some debate about closing the pool (in the construction summer of 1976 it was opened two weeks later than the other two public pools in Decatur), and despite the fact that in 1976 the other two pools for the first time eliminated entrance fees (Ebster pool had always been free), there was sufficient decline in Ebster attendance to make a strong inference that the construction decreased attendance. This decrease in attendance was essentially due to three factors: first, the barrier effect of the construction, which served to separate primary users from the facility; second, the less pleasant conditions around the pool due to the construction; and third, the loss of other facilities at Ebster (such as the playing field) which

also attracted users, some of whom also swam during multi-purpose visits.

It seems clear that this impact, although not the precise degree of it, could have been predicted. (This is not intended to imply that, had the impact been predicted, it could have been easily mitigated. Indeed, it might not have been feasible to mitigate it. One of the values of prediction of impacts is that it enables reasonable tradeoffs to be made about mitigation and impacts, involving such factors as severity of impact, degree of mitigation possible, duration of impact, cost of mitigation procedures, and others.) The barrier effect, of which this is an example and of which other examples are discussed below, is a very important type of impact. (See also Section 4.1.2.) The tunnel construction itself lies between the users of a facility and the facility itself. In the case of Ebster pool, the fact that the great majority of users are under 14 years of age may suggest greater resourcefulness on their part, but it also suggests that they may incur greater risks in dealing with the construction hazards.

5.2.2 Two Supermarkets

The nature of the barrier effect is also clearly seen in considering two supermarkets which are close to one another. The market of the national chain is about two blocks north of the construction; its primary customers are blacks from the southern part of Decatur. Many of them are poor: the store does significantly more business during the week when welfare checks arrive than during the rest of the month. The store of the regional chain is about the same distance north of the construction, within two blocks of the other store, but its primary business is with white residents of Decatur, most of whom live north of the store and thus north of the construction.

The national chain store has suffered considerably, reporting a decline in business of approximately 30%. The regional chain store, on the other hand, has experienced very limited reductions in patronage, since its customers do not have to cross over, or detour around, the construction to reach it. Thus, it is not the absolute distance between the store and its customers, but rather the physical placement of the excavation in relation to the store and its patrons that creates the disruption. This is confirmed by the fact that when Church Street was reopened and patrons of the national chain store could again easily reach it, business went back up.

This impact could have been predicted, but with a little more difficulty than the impact at Ebster pool. The important thing for the planner to have known, in order to accurately predict this impact, was the different nature of the clientele of the two stores. Mere consideration of the size of the stores, of their gross receipts, or even their physical location relative to the subway construction would not have been enough. What was needed was the additional factor that the clientele of the national chain store was mostly poor, suffered from the barrier effect, and had little or less reliable access to private transportation.

5.2.3 The Retail Block

Both of the previous examples have dealt with access-related impacts. In neither case was it an example of direct access, of the front door being blocked or the sidewalk torn up. In general, when direct access is affected, there will also be associated impacts of noise and dust, since interference with direct access implies close proximity to the construction. The central business district provides the clearest example of these kinds of disruptions, the impacts of which are often difficult to disentangle.

The commercial block of Sycamore Street contained about 30 stores, half of which -- on the northern side of the street -- had to be taken for the construction of the Decatur Station and a planned pedestrian mall on top of it. The remaining stores all face on the excavation, and have experienced varying degrees of disruption due to obstructed access, noise, dust, and elimination of parking spaces. The short-term effects on almost all of these stores have been severe, although one or two have been able to attract nearby office workers as "captive patrons."

The disruptive effects on these stores could have been predicted fairly easily. The stores' location immediately along the construction corridor made negative impacts extremely likely to occur.

However, if the planners' task had been to predict precisely which causative agent would bring about which disruptive effect, this would have been extremely difficult in this situation (and in many similar ones). This arises from the fact that the disruptive effects to be predicted come from impact-causing agents acting together. Even at the after-the-fact assessment stage, it is extremely difficult to segregate out the negative impacts caused by accessment impairment, by dust, by noise, and by other factors. It would have been all the more difficult to make such distinctions during the planning stage, which is when prediction must occur.

This difficulty can be overcome by focusing not on the impact-causing agents (which run across the top of our assessment matrix), but on the affected groups (listed down the side of the matrix). Section 4.1.2 has already suggested some of the most severely affected groups (as well as some of the most important impact-causing agents). In the next section, therefore, we shall look at impacts, and their predictability, from the point of view of <u>who</u> is affected. This strategy not only has the advantage of avoiding the difficulty of having to disaggregate the various causal factors that operate in the construction

area, but -- even more importantly -- it leads us to the area of the planner's concern, namely, people.

5.2.4 Special Populations

In addition to groups very close to the construction (such as the retail stores on Sycamore Street), various other special populations can be identified at the prediction stage as those on whom a variety of impacts, from various sources, might fall. These groups might basically be defined as the transportation handicapped: the elderly, the young, the poor, and the handicapped.

There are several nursing homes and housing projects for the elderly (some of whom are handicapped as well) in Decatur, and the residents of these have been rather severely impacted in a variety of ways. Since the elderly tend to stay home during the day far more frequently than other people, they tend to be affected more severely by impacts than other residents. In addition, they may tend to be more sensitive to disruptions in their daily routines. For example, shopping is a major activity, and coping with the barrier effect and noise, dust, and so forth during construction may require considerable planning and coordination.

Young people are another special population: some effects on them have already been alluded to in the discussion of the Ebster pool. In addition, the Beacon School was very near the construction and educational activities were affected by noise and dust, by the consequent need to keep windows closed, and by the "attractive nuisance" nature of the construction activities.

The third special population consists of the poor. They are negatively impacted in two ways: first, by definition they have fewer resources to cope with any unusual events, so any disruption will tend to be more disruptive to them than to more affluent persons, since they have fewer options in dealing with it. Thus, when access to

Gateway Manor was blocked at what had been the most convenient way to get downtown, the residents were harder hit than more affluent persons would have been. To get downtown now requires additional taxi fare (50¢), something of little consequence to persons better off financially, but distressing to the teneants of Gateway Manor. Second, the poor have fewer resources and less ability in dealing with institutions and agencies; they reported few complaints to MARTA or to the contractor, although they expressed a considerable number of complaints to memebers of the study team, when their opinions were solicited. If problems are not voiced, of course, they are not likely to be addressed.

An informative example of this last point is the matter of the clay steps. Residents of Gateway Manor Housing Project built a series of steps out of the Georgia clay soil that enabled them to go from the rear of the project to the downtown area with considerable convenience, avoiding the construction barrier in front of the project. However, these steps were slippery when wet, and were generally difficult to negotiate for those unwilling to risk getting dirty or to see using them as an adventure. Residents sought to have wooden steps put in, at an estimated cost of $800. However, building the steps required a change of order for the contractor, reassignment of several men, consideration from an insurance point of view, and other such activities. As a consequence, almost six months elapsed before the steps were finally built, although everyone involved was convinced that they were a good idea. (The actual cost was about $2,000.)

With construction so close to Gateway Manor, it would have been easy to predict that there would be impacts on the residents of the project, especially because these are low-income persons. However, it would have been very difficult to anticipate the need for the wooden steps. Nevertheless, it would have been quite possible to predict that some sorts of changes and quick action might be required to mitigate impacts during the construction. Furthermore, the reason that these

mitigating measures could not be accomplished rapidly -- the slowness of institutional responses particularly to complaints from the poor -- could have been anticipated, although the particular manifestation of these responses could not have been foreseen.

5.3 PREDICTION LOGIC

The examples in the previous sections have pointed out a number of the types of impacts which occurred in Decatur and have raised issues about their predictability. In this section, a logic for prediction is presented. Prediction is valuable for the purposes of mitigation since it is generally much easier and less expensive to mitigate (or avoid) an impact before it occurs, rather than attempting to undo its effects once it begins. Thus, questions of mitigation will be touched on occasionally in this section, although a fuller discussion of mitigation measures is reserved for Section 6.

We begin with some general steps in the prediction procedure, in Section 5.3.1 and then add some special factors that need to be considered in prediction, particularly insofar as they help define mitigation strategies, in Section 5.3.2.

5.3.1 General Considerations

It should be repeated that prediction of impacts at the planning stage does not have to be extremely detailed or precise. Its goal is to facilitate the identifaction or development of methods that will mitigate likely impacts, so it is only necessary to predict the approximate types of impact with some general indications of their severity on three dimensions: people affected, duration of impacts, and magnitude. Prediction, for the purposes of mitigation is valuable since it is generally much easier and less expensive to mitigate (or avoid) an impact before it occurs, rather than attempting to undo its effects once it begins.

The difficulties in prediction to this level of detail are not primarily methodological; no sophisticated research apparatus is required. Rather, the major difficulties come in organizing the planning activities and motivating the participants so that a serious effort is devoted to prediction and thus, by extension, to mitigation.* In this section, a relatively straightforward series of steps is presented that can be used for prediction of impacts. The apparent simplicity of the method should not detract from either the importance of prediction or hide the fact that it is unfortunately all too infrequently done.

The four steps outlined below reflect a basic approach to prediction that forces attention to significant issues during planning. The basic steps are as follows:

a. List and consider the businesses, residences, and other properties along the alignment. These will bear impacts from multiple sources and it may well prove fruitful to aggregate across impact-causing agents in considering this group.

b. Consider individuals and groups on both sides of proposed alignment and how they will be affected by the barrier effect. This requires consideration of the patterns of movement in the community and will necessitate detailed examination.

c. Define the special populations, particularly the transportation-handicapped, who may be affected by proximity to the alignment, by the barrier effect, or by some other disruptions to their patterns of activities and access.

d. Consider institutional relationships from the point of view of the potentially impacted public. Look at such issues as access to timely information about the project, access to the relevant factors among the various institutions involved, outreach, and ability to respond rapidly and flexibly to problems.

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*Methods of rectifying this in a structured way might include requiring some form of impact prediction, with development of associated mitigation strategies, at the planning stage as a prerequisite for funding. The example of the Environmental Impact Statement is worth considering.

5.3.2 Special Considerations with Mitigation Implications

Defining the major impact corridor. When the rapid transit construction is being planned, the alignment is carefully mapped for development of the take line and other such purposes. This same activity also helps define the major corridor of intense impact. It will be more useful for mitigation purposes, if several attributes of each establishment are examined. Businesses will have different problems from residences; public institutions will have different problems from private ones; retail merchants will have different problems from wholesalers or manufacturers. For retail businesses close together -- an outstanding example would be the Sycamore Street merchants in Decatur -- it may be possible to develop mitigation strategies which address predicted impacts across the group. This was actually done in Decatur when the problem of the loss of parking spaces on Sycamore -- a problem for all of the merchants -- was addressed by the construction of a new parking lot behind the stores.

Owners and renters. An additional important distinction that must be kept in mind when predicting impacts on business is that between owners and renters. In general, it can be expected that in the long run properties will be improved by the construction, so that an owner will eventually reap the benefits arising from the appreciation in value of his building. A renter, on the other hand, may well have his rent raised when the subway is complete, thus paying for that benefit (while not having received any compensation for the construction-induced disbenefits). In Decatur, for example, long term leases for properties on Sycamore Street have been changed to leases of two or three years' length, thus enabling the property owner to raise the rent when the the construction phase is over. Although this consideration does not affect the type of impact which will be predicted, it does bear on the severity of impact that might be predicted: a renter will feel a construction impact all the more severely, if the ultimate benefit of the construction goes to the owner, while the renter has borne the cost.

Construction techniques. In the prediction procedure, some of the aspects of the construction itself must be considered, such as the construction techniques being used and the timing of some of the construction activities. In Decatur, the fact that some piles were augered and others were driven would have had to be considered in the prediction of impacts. Furthermore, it could have been predicted that pile driving during the hot summer would produce a more severe impact than during the winter. It could also have been predicted that pile driving very close to a school would have severe and undesirable effects. This might have led to the suggestions of a mitigation strategy: pile drive near the school during the summer, when school is out. In fact, this was done. However, this impact was not predicted during the planning stage nor was the strategy developed at that time; rather, the realization that the pile driving would disturb the school came much later (after construction had already started) and the mitigation strategy was worked out, by the school, the resident engineer, and the contractor, only at the last minute.

Population draws. The barrier effect presents some special problems at the prediction stage. Basically, the problem is to define the travel patterns that normally move across the alignment; during the construction, there will be impeded. Proximity to the alignment is also somewhat relevant, since the further away from the alignment, the easier it may be to find alternate routes and the less likely, therefore, the barrier effect is to occur. Thus, prediction should begin by defining several (probably three or four) corridors of increasing distance from the construction, with the assumption that--if other things are equal--the barrier effect will diminish passing outward from one corridor to the next. The basic problem then becomes one of defining major population draws and considering the relationship of the location of the construction to the origin of the population draw.

A first step, then, is to identify the various population draws. Among public institutions, for example, these would include libraries, schools, welfare and other social service agencies, recreation centers, etc. Churches are also important quasi-public institutions, and they can be seriously affected by changes in ease of access. Probably the most difficult step is to define the stores, shopping areas, and other private "attractants" of population in sufficient detail so that it is possible to determine to what extent populations would have to cross the construction site to get to them.

Depending on the number of population draws identified, it may be necessary to interview involved individuals to gain a better sense of the potential barrier effect. It is very valuable, at this stage in the planning, to work with expert informants who know the neighborhoods concerned, since they may be able to provide much useful information at low cost.

It is easy to ignore those who will be adversely impacted by the barrier effect, since they may not be located close to the alignment, since they may suffer no obvious impacts (obstructed direct access, dust, noise, etc.), and since nearby establishments of the same type may be differently affected. (The example, discussed above, of the two supermarkets, comes to mind.) However, these impacts can be severe, they can be predicted in the planning stage, and mitigation strategies can be developed to address these problems.

Special populations. Special populations are important to consider, since -- in virtue of their "specialness" they will tend to be more severely impacted by changes in the environment than others. (For example, the elderly may be particularly disrupted by noise, dust and other such impacts.) The problems of special populations should be considered both in terms of their proximity to the construction and in terms of the barrier effect. It should be remembered that the elderly, the handicapped, and even the young to some degree, may perceive something as a barrier that does not appreciably interfere with others.

In order to be able to make predictions of impacts on special populations, their location and numbers should be examined. There may well be focal points for these populations: schools for the young, programs for the handicapped and the elderly, housing projects for the poor. Potential impacts at and around these sites should be explicitly considered.

Institutional relationships. The ways in which institutional relationships might adversely impact citizens must be considered. How do residents wish and need to interact with various agencies and institutions, and what might go wrong with these interactions? Paying attention to this will make it possible to establish mechanisms and procedures that can eliminate certain problems and deal expeditiously with others when they arise. For example, information about the construction is very important. There is often a great deal of uncertainty surrounding schedules and events in the minds of potentially impacted residents. Timely information can be extremely helpful in enabling people to prepare for these events and thus mitigate their impacts. Such information dissemination is an example of an activity that can be established in the prediction phase: involving residents in the planning can be a first step toward setting up a dissemination function.

Unanticipated impacts. It can and must be anticipated that unanticipated problems will occur. Usually these problems will require a rapid response. The need for the wooden stairs at Gateway Manor is an example of a problem that probably could not have been anticipated, but that required (and did not receive) quick resolution. The question of what to do about the guard dog, also in the Gateway Manor area, might be another example of a problem that could not have been anticipated.

But it is known that such pesky problems will arise. Mechanisms can be developed that will make quick and adequate responses possible. These mechanisms must be established prior to the beginning of actual

construction, if they are to work, for they involve considerable complexity in terms of relationships between the transit authority, the engineer, and the contractor. Lines of communication must be set up early, with the public and between the involved actors, so that the impacts of lost time and of confusion can be minimized.

6. MITIGATION PROCEDURES

In this section, we shall discuss mitigation procedures for tunnel construction, using the experience gained from the MARTA/Decatur case study. As much as possible, we shall tie prediction of impacts into mitigation. That is, we shall be concerned not simply with whether a given impact was (or could have been) mitigated, but more importantly, whether the mitigation proceeded from the fact that the impact had been predicted or whether the mitigation was instituted only after an unanticipated impact had begun to occur.

A detailed analysis of the relation between impact prediction and impact mitigation is presented in the diagram below.

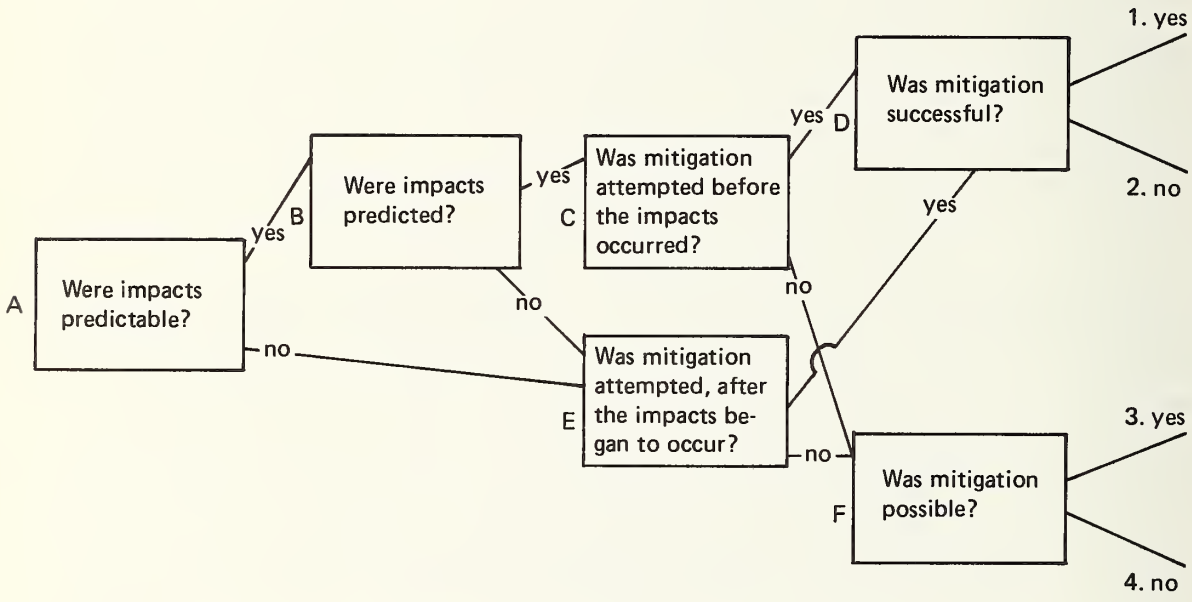

FIGURE 22. IMPACT MITIGATION AND ITS RELATION TO IMPACT PREDICTION

The diagram shows that there are four different outcomes: (1) mitigation was attempted and was successful; (2) mitigation was attempted but was not successful; (3) mitigation was not attempted, though it was possible to do so; and (4) mitigation was not attempted and it was not possible anyhow.

It must also be noted, however, that there are three different routes shown in the diagram for arriving at mitigation (whether successful or not). One route is by predicting the impacts before they occur and then trying to avoid or mitigate them. This is route A-B-C-D. The other routes are those taken if impacts are not predicted and mitigation measures, therefore, are instituted after the fact (i.e., after impacts have begun to occur). This is either route A-B-E-D, or E-D. The latter is the route if the impactsare intrinsically unpredictable, so that mitigation has to wait until after the impacts have become apparent.

Similarly, if mitigation was not attempted (and mitigation either could have been attempted or wasn't possible), there are three different routes. One route is A-B-C-F: impacts were predictable, they were predicted, but no attempts at mitigation were made. The second route is A-B-E-F: impacts were predictable, but were not predicted; when they began to occur, mitigation was not attempted. Finally, the third route is A-E-F: The impacts were not predictable (and so, of course, were not predicted); when the occurred, mitigation was not attempted.

We shall now give examples of some interesting mitigation procedures and attempts in Decatur. We shall separately consider measures designed to cope with environmental, economic, and social impacts (6.1). We shall then turn to some institutional procedures that might be used to mitigate impacts in general (6.2).

6.1 MITIGATION OF ENVIRONMENTAL IMPACTS

6.1.1 Noise from Pile Driving

The noise impact of pile driving was predictable and was predicted. Mitigation measures were attempted in one segment of the construction (along Sycamore Street), but not along another section (the portion from the portal just past Ebster Park, across West Trinity Place, past Gateway Manor, and under Swanton Way to the Old Courhouse). Mitigation consisted of augering the piles, i.e., sinking them into predrilled holes, before driving them the final distance. Where attempted, augering proved successful in reducing noise. We thus have an instance of A-B-C-D-1.

On the other hand, where augering was not used, we have an instance of A-B-C-F-3. Here one must ask, if mitigation was possible, why wasn't it used? It may be, of course, that for engineering reasons augering was not possible, or at least not as readily feasible, in the portion of the alignment where it was not used. If that were so, then the mitigation attempt was impossible and we would have an instance of A-B-C-F-4.

Another attempt at lessening the noise disruption due to pile driving was made by the timing of the construction. This occurred near the Beacon School. In order to interfere as little as possible with school activities, the contractor did all the pile driving near the school during the summer months. When school reopened in the fall, that phase of the construction was over. This mitigation measure was highly appreciated by the staff of the Beacon School. This was an instance of A-B-C-D-1.

At the same time, one must realize that the benefit to the school was achieved at some cost to nearby residents. Because all the pile driving occurred during the summer, residents were exposed to the noise at a time of year when windows are generally open, especially in low cost units without airconditioning. Many such families live near the Beacon School, particularly in the housing projects of Gateway Manor and Allan

Wilson Terrace. No mitigation measures were attempted for these families. If anything, the impacts were made more rather than less severe by the changed timing. Whether any mitigation was possible for them depends, of course, on whether augering or some other method of stabilizing the soil was available. Thus we have here a case of A-B-C-F-3 or A-B-C-F-4.

6.1.2 Mud and Dust

In any construction involving excavation, it can be predicted that there will be dust and, if it rains, also mud. These impacts did occur in Decatur and are still occurring. However, it appears that those who could have mitigated these impacts did not sufficiently realize the magnitude of these impacts and mitigation measures, therefore, were often insufficient and tardy.

The responsibility for dealing with dust and mud impacts lay with the City of Decatur. It is not surprising that city officials were not prepared for the amount of dust and mud that was generated; they had had no previous experience with a construction job of this size or this length of time. The mitigation procedures available to the City were inclusion of appropriate conditions in the building permits, or, on a more general level, passage of ordinances laying down acceptable procedures for dealing with excavation, run-off water, fugitive particulate matter (dust), and similar impacts. (City ordinances often also include restrictions on the decibels of noise that can be generated by machinery and for how long these levels can be maintained.)

However, ordinances and regulations are not enough; they must also be enforced. The City of Decatur did not feel that MARTA and its contractors controlled dust and mud sufficiently. Furthermore, the City did not think it should have to expend monies in order to check that contractual provisions between MARTA and the contractors were enforced. A series of letters between the city manager of Decatur

and the general manager of MARTA documents the unhappiness of the city. At one point, the city manager threatened to shut down the entire construction job by revoking the building permit, unless dust and mud were controlled more adequately. Agreement was reached on what the contractor would do to control the situation. The General Manager of MARTA noted in a letter that "our specifications require on all our contracts that the contractor keep public and private property free of mud, dust, and debris." He added, "We do not intend to relax on this problem. It is our intention to perform the construction work in the Decatur area with as little inconvenience to the public as possible."[1]

Part of the City of Decatur's problem arose from the fact that its ordinance concerning trucks hauling dirt was insufficiently specific. Rather than simply requiring that trucks loaded with excavation spoils be covered, the law stated that a truck should not be loaded in a manner such that its load might spill onto the public way. Thus, the law required that spillage of dirt actually be observed before a trucker could be charged with violation of the ordinance.

A second problem for Decatur lay in the fact that it was a third party in the relation between MARTA and its contractors. MARTA's contracts specified (as the letter from the Genreal Manager cited above indicates) that protective measures against environmental impacts be taken. The City could not enter into this relationship except with its only weapon, the revocation of the building permit. This step is so drastic (resulting in delay of construction, large monetary losses to MARTA and the contractors, unemployment, and questions of possible legal liability) that any city would be hesitant about using it. Clear, specific, easily enforceable city ordinances about what trucks can and cannot do are much more effective. At one point the City of

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[1]Letter from Alan F. Kiepper, General Manager, MARTA, to Curtis Branscome, City Manager, City of Decatur. July 23, 1976.

Decatur did use its police powers to control the dump trucks. In one day, 28 citations were issued to truck drivers for a variety of violations (among them, no turn signals, no registration papers); two drivers were arrested for driving without a valid driver's license. This put pressure on the contractor to abide by city ordinances, but it did not, of course, deal directly with mud and dust.

The entire story of mud and dust, then, is one of predictable impacts that were predicted. Some mitigation measures were attempted before the impacts occurred, but were only partially successful. Other mitigation attempts were made after the impacts occurred (and were more severe than anticipated), resulting in some successes and some failures. Thus, the routes can be described as A-B-C-D, with the outcomes both 1 and 2. Another route was A-B-E-D, with again some successes and some failures, or outcomes both 1 and 2.

6.2 MITIGATION OF ECONOMIC IMPACTS

6.2.1 Economic Losses to Businesses

The losses to the retail businesses along Sycamore Street were predictable. With the street reduced to a narrow sidewalk, with half of the businesses gone (thereby lessening any "joint attraction" effect), with the stores exposed to noise, dust, and mud, any planner would know that business would fall off. It is possible that the planners in Decatur did not realize how severe the impacts would be, because they had had no previous experience with a large-scale downtown disruption such as is presented by subway construction. But there could be no doubt that business would suffer. Yet mitigation was not really attempted. Some minor attempts were made, such as requiring the dust to be hosed down and augering rather than driving the piles. But as far as the direct economic impact on the retail stores is concerned -- their dollar losses resulting from reduced volume -- nothing was done about this.

This lack of action is probably due to the perception, on the part of MARTA and also on the part of the City of Decatur, that nothing can be done about these losses. MARTA is not authorized to compensate stores for alleged losses or reductions in profit; neither, of course, is the City. We seem to have a case of A-B-C-F-4. It is at least worth investigating, however, whether some sort of mitigation measures might not be possible in cases like this. Granted that neither a transit authority nor a municipality can make what might appear to be gifts, either of these or perhaps the County or even an agency of the federal government might wish to make loans to the affected stores in order to help them through a difficult period. If these loans were low interest bearing, or if the interest and amortization payments were deferrable for several years, the loans might help the stores with difficult cash flow situations. Stores might be enabled to weather the disruption of the construction and ultimately benefit from the finished subway. Without some provision such as this, some of the stores may not last to reap the benefits of the rapid transit station.

Even if low interest loans are not possible, or are not the right mechanism for dealing with the problems of retail stores, some device must be found to make reasonably sure that those who suffer the costs of the construction -- namely the store owners -- will also be able to enjoy the ultimate benefits. This is particularly true if the store owners rent their space. In that case, the owners suffer the reductions of business, including the tensions and anxieties associated with a non-prospering business, while their landlords will ultimately reap the benefits in the form of increased property values and higher rents.

We noted earlier that the super market on Church Street suffered a considerable reduction in sales volume, because of the difficult access while Church Street was closed. This impact was predictable, although it required some sophistication to identify it, since a planner

would have had to study the clientele of the market in order to discover that most of them lived south of Howard Street. (Still, this would not have been too difficult; the manager of the store was quite aware of where his customers came from.) In any case, it is probably accurate that this impact was not predicted. No mitigation was attempted here. (A-B-E-F) As in the case of the stores on Sycamore Street, the feeling probably was that no mitigation was possible. The same arguments used above would apply here, too: it might well be in the interest of one or another governmental agency to help a store like this super market financially in any legally acceptable way, thereby maintaining property values, sales tax receipts, and continuing to keep the downtown area viable as a shopping center.

In addition, if someone had predicted this impact, other mitigation measures might have been possible. Church Street might not have been closed until all the materials were in place, to make certain that the closure would be as short as possible. Or, only half of Church Street might have been dug up at a time, with the remianing portion serving at least as pedestrian access. Then, when the dug-up portion had been decked, the other half of the street might have been dug up, thus always maintaining at least some access on Church Street. Or, it might have been possible to construct a bridge over Church Street before digging it up, so that Church need never have been closed. We can make no attempt to evaluate these possiblibities in terms of extra cost, extra time, or engineering feasibility. But it seems that some thought could have been given to these possibilities, if someone had realized how serious the disruption would be that arose from the closure of Church Street.

6.2.2 New Parking Lot Behind Sycamore Street

Loss of parking spaces on Sycamore Street because of the subway construction was easily predictable and was predicted. The City of Decatur attempted a mitigation measure: a new parking lot was built

behind the stores on the south side of Sycamore Street, providing at least as many parking spaces as had been lost. The mitigation measure, however, was not totally successful. Shoppers did not seem to want to use the new parking lot and merchants were reluctant to encourage its use by providing access to their stores directly from the parking lot.

This example shows that even the best intentioned attempts are not always successful. It may well be that ultimately the parking lot will see heavier use, as shoppers become accustomed to it. This may be a matter of time (because driving and parking habits are hard to change) and may in fact occur only after the subway construction is finished. The parking lot will still be useful, since there will be no vehicular traffic at all on the new mall on Sycamore Street. It may not, however, have served the function of relieving the parking problem during the construction period. It would seem that no one can be faulted for this: the lot is there, and it is up to the shoppers to use it.

The parking lot, then, is an example of A-B-C-D-2.

6.3 MITIGATION OF SOCIAL IMPACTS

6.3.1 Access Problems for the Elderly

The Church Street closing affected the elderly residents living in the high rise building at Church Street and Trinity Place very badly. Few of them own automobiles, and many of them relied on the North-South Decatur bus which used to travel on Church Street. With the closure of Church Street, the bus was rerouted several blocks to the west, so that residents of the building had a walk of several blocks' length to reach the bus stop. This was particularly awkward for them if they used the bus to reach a shopping center and returned with packages. (Many elderly persons prefer to shop in shopping centers -- reached by the bus -- rather than in downtown Decatur, because many stores are close together, there are no steps, and because they feel less apprehensive about crime than in a downtown area.)

This impact certainly was predictable; it is not clear whether in fact it was predicted or not. In any case, no mitigation measures were taken, probably because the closure of Church Street was not anticipated to last nearly as long as it did. Either by route A-B-C-F or route A-B-E-F, we arrive at the fact that no mitigation attempt was made. And yet it seems that it could have been done very easily: First, it is not clear why the bus had to be rerouted so far from its previous route; if it had stayed closer to its original route, the elderly in the tower apartments would have been less severely affected. Second, if there were engineering or traffic reasons why the bus could not stay close to Church Street, MARTA could easily have provided a shuttle bus (after all, MARTA is a bus company) to carry passengers from the intersection of Church Street and Trinity Place to where they could catch the rerouted bus.

6.3.2 Access Problems for Gateway Manor

We have mentioned several times the fact that the rapid transit construction eliminated the most direct and convenient route for travel between Gateway Manor and downtown Decatur. This was certainly a predictable impact, since reduced or denied access is easily apparent from construction drawings. Nevertheless, the closing of the access from Gateway Manor to West Trinity Place does not appear in the official listing of Street Closures in Decatur, probably becasue this was a private drive that was being closed off, not a public way. Hence it is possible that this access problem was overlooked.

Whether or not the impact was in fact predicted, no mitigation measures were taken. One can guess that the reason for this is that there was still access to the housing development, by means of a drive that goes into Waters Street, somewhat west of the closed drive. What was apparently not realized (or not considered sufficiently important) was that the population of Gateway Manor is largely transportation-handicapped. Families here rely on public transportation, including

taxis, or on walking, to take them to and from their destinations. The construction impact was an increase in the taxi fare, or a longer walk (using Waters Street), or a difficult and dangerous walk (using the primitive steps in the clay).

Obviously, MARTA could do nothing about the higher taxi fare. However, a shuttle bus might have been considered here as well as for the elderly residents in the high-rise towers. After a long delay, the mud steps were replaced with a set of permanent wooden stairs, enabling residents to reach downtown Decatur on foot in safety. The delay of six months imposed heavy travel burdens on the affected residents.

On our diagram, the process would be described as A-B-E-D, with the final outcome first 2 (unsuccessful attempt at mitigation, because the steps could not be quickly constructed), but ultimately 1 -- the steps went in.

6.3.3 Loss of Recreational Facilities in Ebster Park

The rapid transit line separated Ebster Pool from the Ebster Recreation Building and forced a longer walk for users who came from east of Atlanta Avenue. This impact was predictable and was predicted. A new gravel road was put in so that Ebster Pool could be reached from West Trinity Place as a partial mitigation measure.

The loss of the baseball playing field was also predictable, since the cut for the rapid transit line went right through it. Apparently no mitigation measure was planned; the feeling was that the recreation facilities lost would ultimately be replaced by facilities at the Beacon School. (The contractor promised to restore the playing field after the backfill had been put in place over the subway box; but this never happened. This was an informal promise. Perhaps, by the time the contractor could have restored the field, the outdoor playing season was just about over.)

Although use of Ebster Pool decreased during the summer of 1976 from previous levels -- and this could have been predicted, given the

access problems and the fact that the pool was hemmed in by a tall construction fence -- no mitigation measures were planned or instituted (beyond the new road from Trinity Place), since the Recreation Commission saw the pool was having to close permanently soon anyhow. It was in bad repair, and the commission did not feel justified in spending perhaps $20,000 on it, since two other pools in good repair were available in the city.

Thus, we have a case of A-B-E-F-4: no attempt at mitigation was made because it was seen as not possible (or at least not feasible at a reasonable cost).

6.4 INSTITUTIONAL PROCEDURES FOR DEALING WITH IMPACTS

It is probably fair to say that no one of all those involved in the rapid transit construction wishes to cause disruptions. Nevertheless, disruptions occur. Some of course are unavoidable. But some occur simply because there are so many different actors involved -- the City of Decatur, MARTA, the consultant engineers, the contractors. Their relationships interweave and often are unclear. Even where they are clear, they are complex. No wonder, then, that many attempts at mitigation or prevention of impacts get caught in bureaucratic red tape.

It is also true that while nobody wants to cause impact, prevention of impacts is not the first goal of any of the major actors. It is at best a second or third goal of some of the actors. MARTA's primary goal is to get the rapid transit line built and into revenue service. Decatur's goal has to be also to see to it that the construction is accomplished speedily, so that the revitalization of downtown can begin. The contractors need to get their contracts finished according to specifications, as rapidly as possible, in order to make the maximum profit. The consulting engineering consortium -- through the resident engineers -- have to keep both MARTA and the contractors happy.

The federal government (which provides most of the funding for subway construction through the Urban Mass Transportation Administration) is independent of any of these concerns. It can attempt to balance the costs of impacts and disruptions against the costs incurred by impact mitigation measures. If UMTA were to issue regulations about impact mitigation, and if compliance with these regulations were a conditions for receipt of federal funds, then of course, mitigation would assume a high priority for all the institutions involved.

One step that might help to mitigate impacts would be to provide a checklist of things to consider for each community. Impacts are now considered at the EIS stage -- long before all the specifics of route selection and construction techniques are determined. When the route has been finally determined and contracts are about to be let, another look could be had at likely impacts. At this time, the checklist mentioned above might be utilized. The list would probably be based on many of the items in our impact matrix and deal with specific groups affected in the community at hand and specific agents that are likely to cause impact in this community.

In addition to general bureaucratic problems (no different from those that arise in any large construction project), there were some special problems in Decatur. One problem was that the City of Decatur lacked expertise in the techniques of tunneling. This is not surprising, since subway tunneling at best is rare and has not been done in the United States for approximately 25 years prior to the renaissance that began with the BART construction.

This lack of expertise blunted the City's effectiveness in drafting the construction permit issued to MARTA. The document contained numerous omissions and was often vague in its working. For example, while the City insisted upon piles being augered in the downtown portions of Sycamore Street, such a provision was absent from the specifications for Swanton Way and the residential portions of Sycamore Street. The results of this oversight -- assuming that augering would have been feasible here -- have been considerable noise

disruptions. We have already mentioned the weak language of provisions relating to dust and mud control.

A second problem which the City faces in its efforts to obtain compliance with the construction permit provisions is its lack of manpower to monitor the contractors. It is the City's view that such surveillance should be the responsibility of MARTA. In an effort to fill this manpower gap, MARTA funded two liaison positions in DeKalb County; one was to deal with engineering problems, and the other with problems of a non-technical nature. MARTA's Department of Planning and Public Affairs found it helpful to have these coordinators on the scene in Decatur.

There is a great need for the institutions involved to provide information to all concerned about what is happening, why it is happening, how long it will last, and what comes next. MARTA has an active Community Relations office, which has been helpful in providing such information. MARTA's hotline operates twenty-four hours a day and is well publicized. Its publication Building Together is widely distributed; it provides information on progress of construction and what is expected to happen next.

A great deal of useful community relations and information work was done by the resident engineers. They are in a good position to provide information to anxious residents because they know what is happening. The two engineers and their staffs in Decatur did excellent jobs in providing information. Resident engineers, however, are very busy persons and it is possible that this function should be assigned to some other office or persons. At least one of the contractors in Decatur did an effective community relations job by distributing flyers to residents and businesses in the impact area, telling them of the contractor's plans for the next month or so. Contractors should be encouraged to do this at all times, and it might even be worthwhile to allow a small sum of money in any contract for this function.

Finally, we return to a point we made in Section 5: It can be predicted that unpredicted impacts will occur. Only an omniscient person could anticipate all the problems, in all their specificity, that may occur. Even to come close to total prediction of all impacts would be prohibitively costly. What is needed, the, is a quick-response mechanism that is ready to go into action--i.e., to mitigate impacts--once some of these unpredicted impacts have in fact occurred. No one will blame MARTA for not having known that residents would want to climb the bank of the embankment behind Gateway Manor in order to get to downtown Decatur. But MARTA would have avoided a lot of criticism if it had been ready with a mechanism less cumbersome than a change order for the general contractor to install the mitigation measure needed--a simple set of stairs.

APPENDIX A: DIRECTIONS FOR FUTURE RESEARCH

The final report of Phase I of this study (Report No. UMTA-MA-06-0025-76-5) discussed possible directions of future research (see Section 11 of that report, pp. 185-189). We shall conclude our report of Phase II of this investigation by re-examining these research directions, particularly in order to discover whether some of the additional research suggested in Phase I was accomplished in Phase II and whether any additional research needs have been surfaced.

A.1 SUMMARY OF RESEARCH NEEDS PREVIOUSLY IDENTIFIED

Research needs were divided into two kinds: theoretical studies that needed to be done, and data collection of actual impacts that needed to be done.

Three kinds of theoretical studies were identified: those dealing with (1) measurement, (2) aggregation, and (3) assessment. The following studies were specifically mentioned:

Measurement

Measurement of social impacts.

Non-compensable costs.

Development of a theory of threshold costs.

Measurement of particular social impacts, especially those which are of a psychological kind.

Aggregation

Commensurability of impacts.

Aggregation within categories.

Aggregation across categories.

Assessment

Attribution.

Prediction.

Reimbursement factors.

Under Data Collection of Actual Impacts, the Phase I report says the following:

"While the present research has identified and classified many of the impacts that are expected to occur in tunnel construction, there is still a need to collect data on what impacts in fact are encountered in a real, on-going, rapid transit tunnel project. By examining such a project in detail, it should be possible to determine, for example, what impacts are caused in a low socio-economic residential apartment neighborhood. It should be possible to tell which impacts are due to such factors as traffic diversion, to takings of residences, to loss of community service facilities, etc. A dollar value of these disruptions can then be estimated, or some other surrogate measure of the impact determined." (p. 185)

The reader who has read the preceding report should have no difficulty in recognizing that the data collection of actual impacts has been addressed in the MARTA/Decatur case study. Impacts in a low socio-economic neighborhood were identified and discussed. (See for example the impacts on the Gateway Manor Housing Project.) Impacts due to traffic diversion were an important part of the Decatur story: the closing of Church Street, with its attendant traffic diversion created economic problems for businesses (the supermarket, the locksmith shop, and the business on Sycamore Street) as well as social problems for clients of the Decatur Health Center and the elderly residents of the Philips Tower Apartments. Less was discovered about the impacts resulting from the taking of residences, because all of this had happened before the study team ever visited Atlanta. An

excellent example of the impact on a community arising from the loss of a service facility was presented by the case of Ebster Pool.

Nevertheless, there still is room for more data collection and for additional case studies, particularly since the MARTA/Decatur case study did not include any tunnel segment that was being constructed by any kind of boring. One might also wish for a case study (and for data collection) in a more densely populated area, particularly in an inner city, in order to get a notion of the kind and severity of impacts one encounters there. Still, a good many of the data collection needs probably have been met.

As for the theoretical studies, none was addressed in the case study (nor was any supposed to be). The need for these studies was, if anything, reinforced by the MARTA/Decatur case study, particularly those studies dealing with measurement. An important part of the MARTA/Decatur case study dealt with the prediction of impacts and a certain amount of theoretical work was done in this field (see Section 5, above). However, the main thrust of the case study was practical; consequently, even the section on impact prediction was much more concerned with what could be done practically to predict impacts than with the theoretical underpinnings for a theory of prediction. Much work, then, still needs to be done in the field of theoretical studies, although--as this case study shows--much can also be accomplished in the area of impact assessment and prediction even while the theory lags behind.

A.2 ADDITIONAL RESEARCH NEEDS IDENTIFIED

There are basically two additional needs that can be seen now. One has already been mentioned. This is a need for additional data collection, in one or two other case studies, in order to round out the picture presented by the MARTA/Decatur case study. These other case

studies, we noted above, should concentrate on areas that (1) are different in their socio-economic make-up from Decatur, such as highly built-up or densely populated segments of an inner city; and (2) are being affected by construction using different methods from those used in Decatur. Much of the construction in Decatur was done by the open trench method, with only a minimum of covering being provided (basically, only at intersections). Construction impacts should be investigated that arise from boring and perhaps even from a more truly cut-and-cover method than was used in Decatur.

The other additional research that is strongly suggested by the MARTA/Decatur case study is a test of the methods developed so far. In the present case study, we basically conclude that it is possible, within certain general limits, to predict impacts of construction, particularly by examining the populations likely to be affected. We note that the impacts which we identified in Decatur could have been predicted--in our opinion--prior to the construction, in the planning phase. We also suggested that--given the prediction of impacts at the planning stage--certain mitigation measures might have been taken which would have reduced the severity of the impacts, even if they could not eliminate them altogether.

These assertions should be tested. The following suggests itself as a neat and simple research design. Two construction segments should be chosen in an area where actual construction has not yet begun, but where the alignment of the tunnel has been determined. These two segments should be approximately equal in length (between one and two miles) and should traverse neighborhoods that are similar in character. In fact, the two segments should be as similar to one another as it is possible to find them. For example, if one segment includes a station, then the other segment must also include a station.

Once two such segments have been found, study teams should be sent to investigate both of them. Using the methods identified in the earlier phases of this study, impacts from the construction should be predicted. In one of the two segments the study team should work with the transit authority, the engineer, and the contractor. On the basis of the impact predictions, the study team should suggest mitigation measures which--one would hope--would be implemented to the extent practically possible. In the other segment, however, the study team would restrict itself to the prediction of impact.

As the construction begins and then proceeds, an opportunity will be afforded to test the impact predictions. Will the impacts predicted in fact occur? Will they occur where they were predicted? Will the severity be anything like what had been predicted? Do significant impacts occur that had not been predicted at all? In the segment where the study team suggested mitigation measures, it can be tested whether these measures were effective (particularly by comparison with the construction segment where no mitigation efforts were suggested). Furthermore, it can be tested whether the mitigation measures were fully effective, or only partially so, whether they were cost-effective, and whether significant other mitigation measures had been overlooked. It must also be tested whether these mitigation measures imposed costs (financial and otherwise) on the contractor and the transit authority that had not been reckoned with.

Because this kind of case study must begin before actual construction and continue throughout most if not all of the construction period, it would be a very lengthy affair, although there might well be periods of time when the level of effort would be low, because nothing or nothing much is happening on the construction.

APPENDIX B: REPORT OF INVENTIONS

No inventions, innovations, or discoveries were made or conceived during the course of this contract. However, several improvements in methodology were made. For example, the impact assessment developed in Phase I of the study was pilot tested and found to be generally workable. An improved "prediction logic" was developed for predicting likely impacts at the planning stage of an urban transportation tunnel project. On the basis of the predictions, mitigation measures can be planned and implemented. The report also lists mitigation procedures that were implemented and discussed others that might have been implemented but were not.

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